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First-Aid to Decrepit Lines

THE importance of keeping overhead line construction in first-class condition is appreciated by the vast majority of central-station managers, and it is only once in a while that one runs across a system in which the standards of line work are so low all over the property that almost any change in construction would seem to be a change for the better. Not long since, however, it was our fortune to come within hailing distance of a small country plant which had been a particularly serious offender against the canons of first-class construction and maintenance. We are glad to say "had been," for new interests have since acquired control of the property and are rapidly putting the overhead work into good shape. In fact, the improvements effected were a telling feature of the purchaser's case when he appeared before the local utility commission and sought permission to consolidate the property with a better managed system.

In referring briefly to some of the bad features of the old construction, it should at once be said that no conclusion should be drawn that the methods adopted are in general use in the electrical utility field. It is simply interesting to point out a few of the defects which have since been remedied, in order that such practice, even in part, may be avoided in temporary as well as in permanent work in the future. One feature which was objectionable was lack of care in the location of high-voltage wires as regards lower potential circuits. In some cases these two classes were installed on the same crossarm; in others the spacing between leads of the same class was far short of the limits recommended in good practice; and in others, the lines were temporarily laid on the crossarms without suitable insulators, the spacing in the spans sometimes being secured by porcelain tubes. Primary wires were found attached to buildings of residential type; crossarms of ancient vintage were held in place by ropes instead of by bolts; and even the different phase leads were suspended by ropes at certain points. Guy wires lacked strain insulators and wire as small as No. 10 B & S was used in 2300-volt inter-factory service, in one case No. 14 being employed. The reconstruction crew refused to install anything smaller than No. 6 in this work. Inspection and emergency repairs were at a low standard, indeed.

We are glad to bear testimony that construction of this sort is today regarded with utter disapproval by electrical engineers of standing. The system which has been given first aid was developed originally by a mill owner who built a small private plant and became interested in extending its influence in the immediate vicinity. The absence of a proper engineering policy and disposition to get along with makeshift methods led to a state of depreciation which may well be imagined, and the new owners of the property went before the local public on the strength of line improvements effected with every reason to expect a co-operative welcome. It was only last year that these conditions were in existence, but their revision has mainly been completed and a chapter out of the early years of central-station history closed with the coming of the new regime.

Electric Bonds as Investments

THE high standing which the securities of electric light and power companies occupy in the investment world has again received recognition in a statute recently enacted in the State of Maine. Investments for savings banks in that state are strictly limited to fields which are regarded as offering perfect security to the investor. The new law adds to the permissible list of bonds, available for investment by such banks, the first-mortgage bonds of electric light companies in a designated list of states, it being stipulated that such companies must have a gross income of over $200,000 per annum and a net income equal to double the interest on outstanding bonds and any prior liens. These are reasonable provisions which insure that the corporation in question is a going concern with an established business, a reasonable stability and a successful management.

We have frequently called attention to the incontrovertible evidence of the high rank held by the securities of electric light and power companies, especially when compared with those of railroads and industrial corporations. The smaller risk involved by the investor in electric securities has not been generally recognized, and the bonds of steam railroads continue to find a market at rates of interest lower than those paid on first-class electric power bonds. This recognition is coming slowly, however, and the gap between the quoted prices of the two classes of securities is gradually being closed up. The time will no

doubt come when electric utility corporations will be able to secure funds for extensions upon just as favorable terms as steam railroads, because their securities will be looked upon, as a class, as just as safe as those of any other utility, for they really are. The action of the Maine lawmakers is but another indication of the approach of that viewpoint upon the past of the investing public.

Statistics show that even before the advent of state regulation of utility corporations, the percentage of failures or receiverships of electric companies was as low as for any other class, and lower than for steam railroads and industrial corporations. State regulation has made for even greater financial stability in those states where the commissions have wide powers, and this feature is also recognized by the Maine law in restricting its approval to corporations in certain designated states. Private investors may well take a clue from the provisions of this law and it is quite likely that many of them will be thus guided in their selections.

Eliminating Meter Hysterics

THAT more or less mystery still attaches itself to the design and performance of the ordinary integrating wattmeter appeared in a recent commission hearing before one of the Eastern boards. The circumstance points a moral to the central-station man, whose efforts to make clear the functions of watt-hour measurement seem unending. The query from the board concerned itself with the meaning of the so-called meter "constant" and the possibility of its varying in a given instrument, thus bringing about inaccuracies of registration.

Now every well-informed central-station man knows that the constant of a meter is dependent solely upon the gearing adopted between the driving shaft and the registration dial pointers; that this constant may be 1 or 10 or some other figure determined by a fixed mechanical layout. Whether the meter be fast or slow, the constant is bound to remain the same; it cannot be varied during operation from without or in any other way than by rearranging the gear train, and more than this, the constant cannot be altered by such an accident as a burnout in a coil, fixed or moving, by a variation in the strength of the permanent magnet used in braking the disk speed, or by stripping a gear tooth. This is elementary enough from the engineer's point of view and yet it is of interest from two standpoints: The education of the public and the broader technical efficiency of regulating bodies and legal counsel appearing before them in rate, service or stock cases.

Great efforts have been made in the past by many central stations to clear up all the so-called mysteries of meter performance. Actually, it may be said, a telephone is a far more mysterious piece of apparatus; but it takes a long time to make the public realize anything about the efforts which are made to keep meters within a close percentage of perfect accuracy. Admitting that a meter may run fast or slow is evidently not enough. This question of the inviolability of the constant would probably never occur to a technically trained man as necessary to explain either to a public board or to customers and people in general; but the fact that it arose in a hearing conducted with conspicuous ability by the various parties in interest suggests the wisdom of adding something about the meaning of constants and their fixed character to the body of explanatory material now standardized for use by operating companies in the press, in circulars, on bill heads, bulletins and in direct dealings with customers and prospects.

Helping the Young Engineer

IN an address before a recent convention in Chicago, Mr. Gardner S. Williams, a consulting engineer, made an eloquent plea for democracy in engineering societies, a subject that is worthy of the serious consideration of every engineer. He pointed out that the national engineering societies of today, although they include in their membership several thousand young engineers, nevertheless represent the aristocracy of the profession, and never in any way reach or supply the needs of those who make up the vast numbers dependent upon engineering for their livelihoods, but who have not yet reached that condition where they can maintain themselves by independent effort.

The National societies, it is true, are conservative. Being composed of or at least controlled by those who have achieved their successes under existing conditions, they naturally hesitate at any wide departure from past custom and experience. Furthermore, they are not closely in touch with those who may be said to compose the rank and file of their profession, and therefore do not know to what extent the latter will support such efforts as they may make. Neither is it possible for the latter to be familiar with the objects and aims of the former. Lack of association breeds lack of appreciation.

The American Institute of Electrical Engineers and the National Electric Light Association have both been giving some thought to this subject. Just recently the former society established the practice of holding monthly meetings in various parts of the country which have tended greatly to broaden its influence. The National Electric Light Association through its company sections has perhaps done more than any other similar organization to help and interest the young engineer but even here there is considerable field for improvement.

There are approximately two hundred thousand citizens of these United States who are intimately connected with engineering and the immediate problem before the engineer today is to so unite and organize this multitude that its influence may be most potent for the advancement of society and incidentally for that of engineering itself.

HAPPENINGS IN THE INDUSTRY

Oklahoma Association Holds Annual Convention—Samuel Insull Believes Present Slump in Utility Stock Unwarranted—Greater Democracy in Engineering Societies Needed—Miscellaneous News

OKLAHOMA ASSOCIATION HOLDS ANNUAL CONVENTION.

Problems of Commission Regulation Discussed—Continued Prosperity Seen for Next Two Years.

The sixth annual convention of the Gas, Electric and Street Railway Association, of Oklahoma, which was held in Oklahoma City May 10, 11 and 12, was in point of attendance perhaps the largest in the six years the association has been organized, and in point of interest it was the most important convention ever held in the state.

The convention had among other speakers two state officials, Campbell Russell, new member of the Oklahoma Corporation Commission, and E. B. Howard, state auditor.

Mr. Russell said that all public utilities of Oklahoma should look to the Corporation Commission for assistance and not regard it as an enemy. He discussed the relations of the utilities represented at the convention and said it was the commissioners' intention to give them a square deal. His subject was "The Relations of the Utilities and Corporation Commission."

"If the utilities will regard their business as an investment and not as a speculation," Commissioner Russell said, "they will eliminate a lot of the troubles between state officials and themselves. If the utilities will strive for efficiency and give the public the service to which it is entitled there will be no reason for entanglements with the commissioners."

State Auditor Howard, who addressed the convention on utility taxation, pointed out there was no desire to overtax such corporations, but that the state would insist on them paying their share of the taxes.

The convention was called to order by President C. H. Kretz, of Okmulgee, Thursday morning, at the Lee Huckins Hotel. The visitors were welcomed by Mayor Ed Overholser. Mr. Kretz responded, then giving the president's annual address.

Among the papers presented were the following: "Small Electrical Plant Troubles," by A. R. Sanson of Atoka, Okla:; "Ice and Electric Plant Operation," by David E. Nims, of the Oklahoma Gas & Electric Company, of Oklahoma City, and "Electrical Meters and Testing," by W. B. Clayton, of the Southwest General Electric Company.

The day's session closed with a banquet at the Lee Huckins Hotel at which John W. Shartel, vice-president and general manager of the Oklahoma Railway Company acted as toastmaster. Galen Crow of Tulsa warned the delegates to the convention that in a few months they would probably be called on to produce power and light for the government, and advised them to arrange their plants with this end in view.

Floyd Lewis of Kansas City Power & Electric Company said the public had become unduly alarmed over the prospects of hard times to come and predicted that the next two years would be the most prosperous period in the history of not only the United States but the entire world. He said the government would be spending billions of dollars and that every man and woman would get a share, as most of this money will be spent in this country. He said when the delegates went to their homes they should spread the doctrine of judicious and economic buying instead of hoarding money.

At the closing session it was decided to appoint a permanent secretary for the organization, who will keep all members informed of matters affecting their business, dates of meetings and legislation affecting the public utilities of the state. A committee composed of W. H. Vorce of McAlester, chairman; J. W. Dobbins of Guthrie, J. C. Owen of Muskogee, Galen Crow of Tulsa, J. W. Shartel of Oklahoma City, and L. W. W. Morrow of Norman were appointed to arrange the details.

The following officers were elected:

S. P. Shaffer, of Chickasha, president.

J. C. Owen, of Muskogee, first vice-president.

W. H. Vorce, of McAlester, second vice-president.

Prof. L. W. W. Morrow, of Norman, secretary-treasurer.

George W. Knox, former general manager of the Oklahoma Railway Company, Oklahoma City, was made an honorary member of the Association. The next convention will be held in Oklahoma City.

SAMUEL INSULL BELIEVES SLUMP IN UTILITY STOCKS UNWARRANTED.

Real Values Unchanged and Earnings Justify Continuation of Dividend Payments.

In an interview which was intended to throw light on the sudden drop in public utility stocks, Samuel Insull, president of the Commonwealth Edison Company, Chicago, and head of various other utility companies, stated emphatically that the depression of the shares of utility companies was mainly unwarranted and the scare which has impelled the liquidation unreasonable.

Speaking for the companies with which he is actively associated, Mr. Insull said that while expenses are extremely high they are by no means of an extremity to have warranted the depreciation in the certificates of the general run of utility companies and present dividend rates are not imperiled.

Speaking of conditions in the utility field in general, he said, "It is well to remember at present (when the public is more or less disquieted by the lowering quotations on the stock exchange) that, in addition to the seasonal lower cost of operation, which necessarily exists because of the difference in the demand for fuel between summer and winter, other savings are possible.

"Since the spring of 1915 everything has boomed, with the quite inevitable concomitant of higher prices for all the things so boomed. Gross revenue and expense enhance, not only by reason of the boom, but also because of general extravagance. These extraordinary conditions last winter brought home to the managements the necessity of closer economy of operation to counteract the extravagant trend. A practical virtue was made of this necessity, with the result that the properties with which I am familiar are now fairly well in hand, expense-wise.

"It is not, however, an ideal time for public utilities, for

our selling price is fixed and our cost is majorily contingent on the market prices for material and labor.

"Nevertheless, the same condition which produces dear material and labor also prompts a larger demand for the product of utility companies, so that gross revenue is entirely satisfactory, for the increase in gross of itself means a lower cost in the unit of production. This and the striving for economy, which the high cost of operation in the winter impelled, will, in my judgment, make our position more comfortable during the open weather, and thereby offset in a measure the higher cost and the dearness of labor and coal and other commodities utilized by us.

"As a general proposition, this statement may be applied to the gas business, save that gas is an older business, and has therefore reached a point of saturation where gross does not increase as rapidly as with the electric plants, and is more sensitive to increased expenses.

"The bourse pendulum, as it relates to electric and gas utilities stocks, has swung too far in the adverse direction. In saying this I speak, of course, from the viewpoint of intrinsic property value and of earning power."

PROTECTION OF MUNITION PLANTS CONSIDERED.

National Fire Protection Association Discusses War Measures at Washington Convention.

At the annual meeting of the National Fire Protection Association held at the New Willard Hotel, Washington, D. C., May 8 to 10, the protection of munition plants and warehouses storing food supplies from fire was one of the most important topics considered. The illumination of such establishments by means of flood lighting, as discussed in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for April 28, was considered an essential part of the protective program.

The election of officers resulted as follows: President, Louis Wiederhold, Philadelphia, Pa.; secretary, Franklin H. Wentworth, 87 Milk Street, Boston, Mass.

GREATER DEMOCRACY IN ENGINEERING SOCIETIES NEEDED.

Young Members of the Profession Need Encouragement Gained Through Association Work.

Speaking before this week's convention of the American Association of Engineers, Gardner S. Williams, consulting engineer, made an eloquent plea for greater democracy in engineering societies. He pointed out that the national engineering societies of today represent the aristocracy of the profession, and like all aristocracies are conservative and do not meet the needs of the majority of young engineers who are dependent upon engineering for their livelihoods, but who have not yet reached that condition where they can maintain themselves by independent effort.

Mr. Williams referred to the democratic organization of the American Medical Society and said that "the National Societies have in embryo an organization well adapted to this purpose in the Engineering Council and if they can be brought to see the advantages to come from an extension of it beyond the limits of their own membership, there should be little difficulty in gathering into the combination the 90,000 more or less engineers now affiliated with the National, State and local societies, and we would then come to that great army of more than equal size which until recently was wholly unorganized.

"We should look to the National societies to take their place as leaders in bringing about complete co-operation of engineers. The charge has been made that the proposed Engineering Council is undemocratic, but no one can say it is unrepublican. In a body so large as the National societies, government by conventions will be a failure; it must be entrusted to representatives; and in order that each member may have a voice those representatives must be elected by letter ballot.

"If the national societies fail to meet their responsibilities, if after a reasonable time they do not work out a plan of co-operation involving the utilization of all engineering forces of this commonwealth, then it will be time to turn to other agencies."

NEW SECTION OFFICERS ELECTED BY MANUFACTURERS.

Wire and Cable and Line Material Sections of Associated Manufacturers of Electrical Supplies Meet.

At the meeting of the Wire and Cable Section of the Associated Manufacturers of Electrical Supplies held April 17, at the Yale Club, the following officers were re-elected for this year:

Chairman, LeRoy Clark, Safety Insulated Wire & Cable Company, New York.

Secretary, J. Nelson Shreve, Electric Cable Company, Bridgeport, Conn.

Treasurer, Edward F. Sawyer, Atlantic Insulated Wire & Cable Company, New York.

The Board of Governors of the Associated Manufacturers of Electrical Supplies held its regular meeting on Wednesday, May 16, 1917, at the new offices of the Association, 30 East 42nd Street, New York City.

The Line Material Section held a meeting on Friday, May 4, 1917, at the offices of the Association, 30 East 42nd Street, New York City. The following officers were elected for the ensuing year:

Chairman, W. R. Williams, General Electric Company, Schenectady, N. Y.

Secretary, H. L. Garbutt, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

Treasurer, R. C. Buell, Johns-Pratt Company, Hartford, Conn.

The Rigid Conduit Committee of the Interior Conduit Section held a meeting on April 30, 1917, at the William Penn Hotel, Pittsburgh, Pa. The next meeting will be held June 5.

Society for Electrical Development Holds Annual Meeting and Elects Officers.

The annual meeting of the Society for Electrical Development was held at the rooms of the Society in New York City, Tuesday, May 8. Among those in attendance were: Henry L. Doherty, president; W. H. Johnson, and W. E. Robertson, vice-presidents; J. M. Wakeman, general manager; J. Smieton, Jr., secretary and treasurer; E. W. Rockafellow, Fred. Bissell, N. H. Boynton, J. R. Strong, Ernest McCleary, H. B. Logan, J. E. Montague, H. C. Cushing, James H. McGraw, James F. Killeen and C. W. Price.

A comprehensive and illuminating report was made by the general manager, and the meeting recommended that it be printed in full and sent to all members.

The treasurer's report showed a balance in the bank of $76,000. The board of directors convened immediately after the adjournment of the annual meeting, and the following officers for the ensuing year were elected and appointed:

Henry L. Doherty, president.

W. H. Johnson, A. W. Burchard, W. E. Robertson, J. R. Crouse, and Ernest Freeman, vice-presidents.

J. M. Wakeman, general manager.

J. Smieton, Jr., secretary-treasurer.

Executive Committee: W. H. Johnson, chairman; Henry L. Doherty, W. E. Robertson, Ernest Freeman, L. A. Osborne, A. W. Burchard, Gerard Swope, J. R. Crouse, and J. R. Strong

NEWS NOTES

Municipalities to Lease Utility Properties in Pennsylvania.—Governor Brumbaugh of Pennsylvania has signed Senate Bill No. 201, authorizing municipalities in the state to lease and operate electric light, heat and power plants and properties, as well as water-supply systems.

Senate Adopts Niagara Power Extension.—The Senate has adopted a resolution extending for another year, until July 1, 1918, the authority for additional diversions of water in the Niagara River, New York. Senator Hitchcock offered the resolution, which had been reported from the foreign relations committee, at the request of Senator Wadsworth.

Utility Has Flag-Raising Ceremony.—Twelve hundred employes of the Public Service Electric Company, Newark, N. J., participated in a flag raising ceremony at the Marion power station of the company, Jersey City, April 28. James F. Kelly acted as master of ceremonies. The flag is 18 by 27 feet and flies from a steel pole at the top of the main generating station.

Associated Manufacturers Vote on Tax Questions.—Charles E. Dustin, general secretary of the Associated Manufacturers of Electrical Supplies, has issued a notice to all members calling attention to the report of the National Chamber of Commerce regarding the proposed government war tax. A referendum vote is asked of all members on three separate proposals for raising money.

California Electric Railway Association Elects Officers.—At the annual meeting of the California Electric Railway Association held at the Palace Hotel, San Francisco, Cal., May 8, G. W. Weeks was re-elected president; W. Clayton, re-elected vice-president, and G. K. Weeks, Paul Shoup, Jessie Lilienthal, W. E. Dunn, W. Clayton, W. R. Alberger and W. V. Hill were elected to the executive board.

Time Limit on Kootenai Power Project.—Rights to the power site at Kootenai Falls, Idaho, will be forfeited unless J. A. Coram and associates begin active construction of their proposed power development before June 1. Mr. Coram has been working on the project for 20 years and has expended, according to reports, $75,000 in testing the proposed site and in royalties to the federal government.

Wisconsin Law on Taxation of Public Utilities.—The Wisconsin Assembly has ordered sent to engrossment an amendment to a bill providing a method of valuing the property of light, heat and power companies extending into towns of two or more assessment districts. The amendment provides for the assessment of these properties by the State Tax Commission on the basis of property located within each separate municipal unit.

Milwaukee Company Encourages Gardening.—As a part of its patriotic effort to advance the gardening cause, the Milwaukee (Wis.) Electric Railway & Light Company has offered its employes use of vacant tracts of land on the outskirts of Milwaukee on which to raise vegetables. The offer includes plowing and harrowing of tracts by the company free of charge. The company is offering substantial prizes to the best producers.

Street-Railway Companies to Furnish Street-Lighting Service.—The Pennsylvania Legislature is considering a bill to authorize street-railway companies to furnish electric energy for light, heat and power to consumers along its lines in boroughs and townships, upon obtaining permission from the Public Service Commission. The Legislature also has before it a bill exempting contracts between public utility companies and boroughs or towns from approval by the Public Service Commission.

Government Installs Lamps to Protect Ohio River Bridges.—The Federal Government has purchased ten searchlights for use in illuminating approaches to the bridges over the Ohio River at Louisville, Ky., all of which are under guard. Another of the same lamps has been installed on the roof of the City Hall in Louisville and is used to illuminate the flag at night.

Milwaukee Jovians Win Loving Cup.—The Milwaukee branch of the Jovian Order held a dual celebration recently to commemorate its affiliation with the Milwaukee Electric League and in winning a loving cup in recent competition with other cities in retention of members. Among the speakers were R. M. Van Vleet and Carl Golin. The newly installed officers of the league are: George Kirchgasser, president; L. R. Day, vice-president; Frederick H. Ford, secretary, and L. R. Day, treasurer.

Commission Approves Connecting Line Between Plants.—The Massachusetts Gas and Electric Light Commission has approved a petition of the Eastern Massachusetts Electric Company for authority to construct transmission lines through the town of Saugus for the purpose of connecting the plant of the Salem Electric Lighting Company with those of the Malden Electric Company, at Malden, and the Suburban Gas & Electric Company, at Revere. The several companies are under the management of Charles H. Tenney & Company, Boston.

City Sells Lighting Posts for Munition Use.—The Street Department, Bronx, N. Y., has arranged for the sale of about 6000 old lamp-posts used for gas service, and now superseded by an electric street-lighting system, to R. D. Wood & Company, Philadelphia, Pa., at a cost of $1.06 each, with removal by the purchaser. Prior to the country's entrance into the war the borough had been paying about $11 each to have the posts removed by private contractors, bringing a considerable asset where a financial burden was anticipated. It is said that the posts will be utilized in shrapnel manufacture.

Large Steam Turbine Order.—The Brady interests of New York have just placed with the General Electric Company an order for turbine generators aggregating 200,000 kilowatts, which is the largest order ever given for generators. This tremendous order was given by Thomas E. Murray, the head of the Brady engineering interests, and is divided among the New York and Brooklyn Edison companies and the Brooklyn Rapid Transit Company. The two generators for the latter company are rated at 35,000 kilowatts each, and are to be used in the new subway service of that company.

Public Service Commission Denies Permission for Utility Merger.—The Public Service Commission of New York has refused the application of the Richmond Light & Railroad Company and the Staten Island Midland Railway Company for permission to merge the properties, as well as for an extensive bond issue to be used in connection with the consolidation, holding that the proposed consolidation plan did not meet the views of the Commission. In concluding its report the Commission says: "These companies serve a large and rapidly growing borough (Staten Island). With capable management the earnings of the property should be sufficient to provide adequate compensation to investors, but a conservative plan must be adopted which does not burden income with securities issued to take up past losses and deficits. Public service corporations must be mindful that floating debts incurred for operating purposes and losses must be taken care of by some other means than the easy-going and disastrous financial methods frequently adopted in the past. The claim is made on behalf of the applicants that there has been a recent improvement in management. With such improvement and with sound financial readjustment, the business of the companies may be brought to yield returns which would suffice in a comparatively short period to permit reorganization on a thoroughly sound basis."

Relations of Public Utility Companies to the Public

There Is a Mutuality of Relationship Between Utility and Public Which Cannot Be Ignored—Public Must Show Good Will Towards Company—War Conditions May Improve Relations

By W. W. FREEMAN

President, Union Gas & Electric Company, Cincinnati.

SOONER or later the public must generally recognize that there is a mutuality of relationship between the public utilities and the public which cannot be ignored without injury to the best interests of all. When this time has arrived, and when co-operative action has been substituted for strictly coercive measures, the era of universal good service and reasonable rates will have dawned.

The fundamental purpose of a public utility is to provide a needed service to the public. This service involves the obtaining of capital which is beyond the means of ordinary individual business enterprises, and unless the municipality itself chooses to finance and conduct the operations, a utility company must be formed to provide the service required by the public. This is the primary function of a public utility company, not the mere making of money, which is the sole purpose behind ordinary business enterprises. Money must be made by the public utility company, however, or capital would not be forthcoming for its inception and necessary development. It is now universally agreed that a utility company should not be permitted excessive profits from its public service, but it is equally true and just as important that it must have sufficient profits to enable it to provide and maintain a service which is at all times equal to and, if possible ahead of, the public needs.

New Capital Always Needed.

A peculiar and unavoidable feature of public utility companies is the necessity for constant growth requiring continuous increase in capital investment to meet the steadily growing needs in every community. An average business enterprise can start with a modest capital and build up its business for future requirements out of its earnings, so that the initial capital is all that is furnished by the organizers of the business. In this way many successful and very large business enterprises throughout the country have been built up from very modest initial capital to large and thriving business enterprises. This can never be done in the case of public utility companies, because the capital investment is so extremely large in comparison with the obtainable revenue that rates cannot be charged which are sufficient to meet necessary operating expenses, including depreciation and interest on capital invested and, in addition, realize sufficient surplus profits to provide the ever increasing new capital requirements of the business.

Any successful commercial enterprise is able to do an annual business at least equal to its total capital investment, while the average of the larger business enterprises throughout the country receive an annual income of two or three times the capital invested, and very many business enterprises, especially the smaller ones, have an annual turnover of from ten to 100 times their investment. In marked comparison with these, an electric lighting company is fortunate if its aggregate gross revenue over a period of four or five years is equal to its invested capital. Obviously any business with an annual turnover of five times its capital can sell its product at one twenty-fifth the percentage of operating profit, which a public utility company must earn in order to realize a corresponding rate of return on the capital invested. This will serve to explain why public utility companies are dependent absolutely upon obtaining new capital from year to year for their extensions and business development instead of being able to obtain such increased capital from surplus earnings, as is customary and proper in the case of many ordinary business enterprises. It is this constant requirement of new capital that makes it so essential that the earnings of public utility companies shall be stable and dependable in order that the requirements of the public service may be adequately met. The public could possibly afford temporarily to ignore the claims of those who have invested money in public utility companies, and feel they are entitled to a fair return on their investment, were it not for the fact that such a policy would merely serve to close the door to the securing of the additional capital which these companies must obtain from year to year from the same sources in order that the constantly growing demands of the service shall be provided for.

The continuance of interest and fair dividends upon capital already invested is absolutely essential to the securing of the necessary additional capital. No business man, in his proper senses, would think of asking a bank to increase his past indebtedness if he had to admit his inability to pay the interest on what he already owed. A public utility company which is denied a reasonable return on its existing capital is in identically that position in respect to its further capital requirements.

Rates Are Usually Fair.

An impression has prevailed that public utility companies, when permitted to do so, have collected from the public rates that are unreasonably high in proportion to the capital invested and the service furnished. That individual cases have existed, which taken alone might seem to justify such an impression, may be admitted. No line of business and no community is without those who place personal gain above every other consideration. But any fair minded study of public utility conditions throughout this country, especially in the light of the drastic regularity methods which have been pursued in recent years, must lead to the conclusion that, taken all in all, the public utility companies, and especially the electric lighting companies, in this country have been rendering to the public, in the main, good service at very reasonable rates. It has probably been necessary to adopt many of these regulatory methods as a means of insuring to the public a reasonable degree of certainty as to compliance with proper public demands by the utility companies. It is a source of pride to the utility companies that they have been able to submit to exceedingly drastic regulation with so little change in the methods which were pursued and the rates which were charged under their own voluntary procedure in former years.

If it is conceded that public regulation of utility companies is necessary and proper, it should be agreed with equal positiveness that regulation which is merely restrictive and not co-operative is unwise and in many cases actually harmful to public interest. One of the chief disadvantages of drastic regulation consists in the removal of the proper incentive to gain through unusual initiative and efficiency. In this thought lies the key to proper co-operative regulation. There has been a natural but harmful tendency to adopt arbitrary rules in the fixing of rates. Usually the property has been appraised upon a basis of present value, ignoring actual investment and other meritorious considerations; then a rule of some fixed rate of return has been applied to such valuation and rates fixed accordingly.

This system of making rates puts a premium on inefficiency and indifference in the matter of expenses and encourages one company to continue its indifferent methods in the security of non-interference with its rates so long as they do not exceed a fixed rate of return, while it penalizes another company which, through unusual efficiency, may be giving its customers better service at even lower rates but which through its superior organization is earning a somewhat higher rate of return upon its property valuation. It may be admitted that there are difficulties in the way of applying co-operative regulation fairly in individual cases, but the difficulty of a task is no excuse for shirking any responsibility which bears upon the promotion of the public interest.

The public utility and the public ought to be acting as partners in producing the best possible service at reasonable rates. An effective means of promoting this end may be found in granting an incentive in the form of increased profits in proportion to the degree of unusual efficiency shown by the company. The public is the sufferer not less than the public utility company if such inducement is not offered. To put the matter concretely, it is far better to permit an electric lighting company to earn a nine-per-cent dividend if a rate of eight cents per kilowatt-hour is thereby secured than it is to pay a rate of nine cents per kilowatt-hour even if the company charging the higher rate earns only an eight-per-cent dividend. It may seem paradoxical to suggest that a higher dividend may produce a lower rate, but it may nevertheless frequently be true, and the explanation may be found in the special and justifiable incentive to increased efficiency furnished by promise of proper reward.

Public Should Extend Good Will.

Another way in which the public can co-operate with the public utility company for its own good is through the exercise of good will when deserved in place of the unreasonable criticism which is a popular but mistaken policy in many communities. This criticism is usually fostered by newspapers or other agencies who seek to capitalize it for their own popularity or benefit. There can be no complaint against constructive criticism of any utility company in any community. This is usually invited by the company itself and serves to point out weak spots in the organization which might otherwise be overlooked, but an attitude of ceaseless knocking tends to demoralize the spirit of an organization and reduce its efficiency. The enlightened self interest of a community should serve to protect the utility company from this disadvantage, which is fortunately becoming less prevalent as the true relationship between the public utility company and the public is becoming better understood.

War Conditions May Improve Relations.

It would not be strange if the relations of the utilities and the public should be materially improved through the experiences which are to be met under the war conditions now confronting the nation. It is a fact that the public utility companies generally are awake to their responsibilities and are able to demonstrate this fact more clearly in times of emergency than otherwise. The promptness and effectiveness with which public utility companies may be able to render constructive support to the nation will certainly not serve to lessen the degree of public appreciation which they now enjoy in their several communities. While public service of one kind may seem more pronounced than another, it will be made clear that the companies which have always occupied the place of public servants can most readily and naturally adapt themselves to any larger sphere of public service which may be demanded by changing conditions. The patriotism and loyalty of the public service companies will not be found wanting in this time of the nation's stress.

ADOPT SLOGAN "BUSINESS MUST GO ON."

Society for Electrical Development Inaugurates Campaign to Keep Business Booming—Annual Meeting Held.

"Business must go on" is a slogan which representatives of The Society for Electrical Development are making known in their addresses before associations, conventions and gatherings of electrical men.

America's success in this war depends not alone on its military force, or its increased crops, but also on the power of every citizen to help keep business going.

Addresses of this tenor and direct information upon new selling activities have been made, and are being made, by the three members of the Society's staff who do most travelling.

George W. Hill, on its field staff, is completing a trip through the Middle West and into the Southwest as far as Texas. Mr. Hill has addressed several luncheons along the line and at his farthest point West, Dallas, Texas, spoke before the recent Southwest Electrical & Gas Association convention.

James M. Wakeman, general manager of the Society, has addressed meetings in New England and the larger cities of Pennsylvania. He is scheduled for the conventions of the Missouri Public Utilities Association at St. Louis and Electric Supply Jobbers' Association at Hot Springs the latter part of May.

H. W. Alexander, director of publicity, has just concluded a trip through the Northwest. He reports considerable optimism on the part of the selling end of the industry and believes after the first period of alarm has had its sway that the industry will regain, more or less, its normal activities.

The Society will continue to be an energetic force in its endeavors to keep business moving, for it believes that everything depends upon the individuals holding up their link in the chain of mercantile business.

RATES FOR ELECTRICITY DEPEND ON THE PRICE OF COAL.

Muncie Electric Company Files Arguments Before Commission for Fluctuating Rates.

The Muncie Electric Company, which supplies Muncie, Hartford City, Alexandria, Elwood, Dunkirk, Redkey, Eaton and a number of smaller places in Indiana with electric light and power, has submitted arguments before the Indiana Public Service Commission to be allowed to change its rates for service to conform to coal prices. It asks to be allowed to use a fluctuating scale of charges to consumers, these to go up and down according as the price of coal ascends or descends. Attorneys for the company at the hearing argue that the prices of electricity to its consumers previous to 1916 had been based on the average cost of coal, which is the main expense in the production of electricity, and that since then there has been so great a variation in coal prices, almost from day to day, that it is impossible for the company to establish a price for service with certainty of its being equitable either to the consumer or the company.

Activities of the Commercial Section

Present Officers and Committee Chairmen to be Continued in Office and Work Will Continue During the Year

By ERNEST A. EDKINS

Chairman, Commercial Section, N. E. L. A.

AN extraordinary meeting of the National Electric Light Association was held at headquarters of the Association on May 9 and 10 in place of the usual annual convention. This meeting, small in numbers and confined largely to official representatives of the member companies, included in its attendance many of the most notable men of affairs in the industry, who assembled at this time not only to transact those necessary duties prescribed by the by-laws of the Association, but to consider the very grave problems affecting our industry which have arisen as a result of the existing state of war. Inasmuch as it had been considered inadvisable and inexpedient from every standpoint to present a formal program of reports and papers at this meeting, it was also considered inadvisable to urge the attendance of a large number of Class B members who would ordinarily attend the sessions of the several Sections of the Association. Under such conditions, it was obviously impossible to hold the usual election of Section officers who are elected annually by the members of their respective Sections: the Class A member companies in attendance at this meeting therefore adopted a resolution recommending that no election of Section officers be held at this meeting and requesting that existing officers, chairmen and committee members of the four National Special Sections continue in office until their successors are elected.

It appeared to be the sense of the meeting that activities of these various Section committees would be greatly circumscribed during the ensuing year and that if it were necessary for our committees to "mark time" until more settled conditions prevailed, this result could better be accomplished by postponing for the present a change in organization. No doubt much of the committee work will henceforth be carried on by correspondence and will be in the nature of addenda to reports prepared this year with a view of bringing these reports up to date against the time when there may be an opportunity to present them in convention for discussion.

Present Section Officers to Continue.

In effect, then, the Association has asked the existing officers, chairmen and committee men of the several Sections to continue the responsibilities and, in some small measure, the activities assigned to them last year. This is perhaps asking a great deal of men who have worked hard and faithfully during the last 12 months and whose increasing problems and responsibilities at home would make them welcome a release from the burdens of committee work. The manner, however, in which this obligation has been put up to us by the Association makes it practically tantamount to a public duty. In our small way this additional service which we are asked to perform for the Association is somewhat patriotic in character since it is inspired by the extraordinary conditions of the present time which are keenly reflected in the electrical industry and in the affairs of the National Electric Light Association; and just as many of our leaders are giving freely and unselfishly of their time and thought and effort in connection with the work of the Board of National Defense, so in smaller degree are the Section officers, committee men and members afforded this opportunity to do their bit and to help in the good work of conservation and preparedness.

Due to the brief and limited character of the meeting above mentioned and to the urgent necessity of giving up all of the time available to a discussion of the special problems now before the Association, it was necessary to adopt en bloc the program of papers and reports which would have been presented at the Atlantic City convention. These reports, however, will be distributed to the membership during the current month, and it is but natural to hope that under more settled conditions which may prevail next year, more opportunity will be afforded for full discussion of these reports, which it will be our business to revise and bring up to date.

Work of Commercial Section.

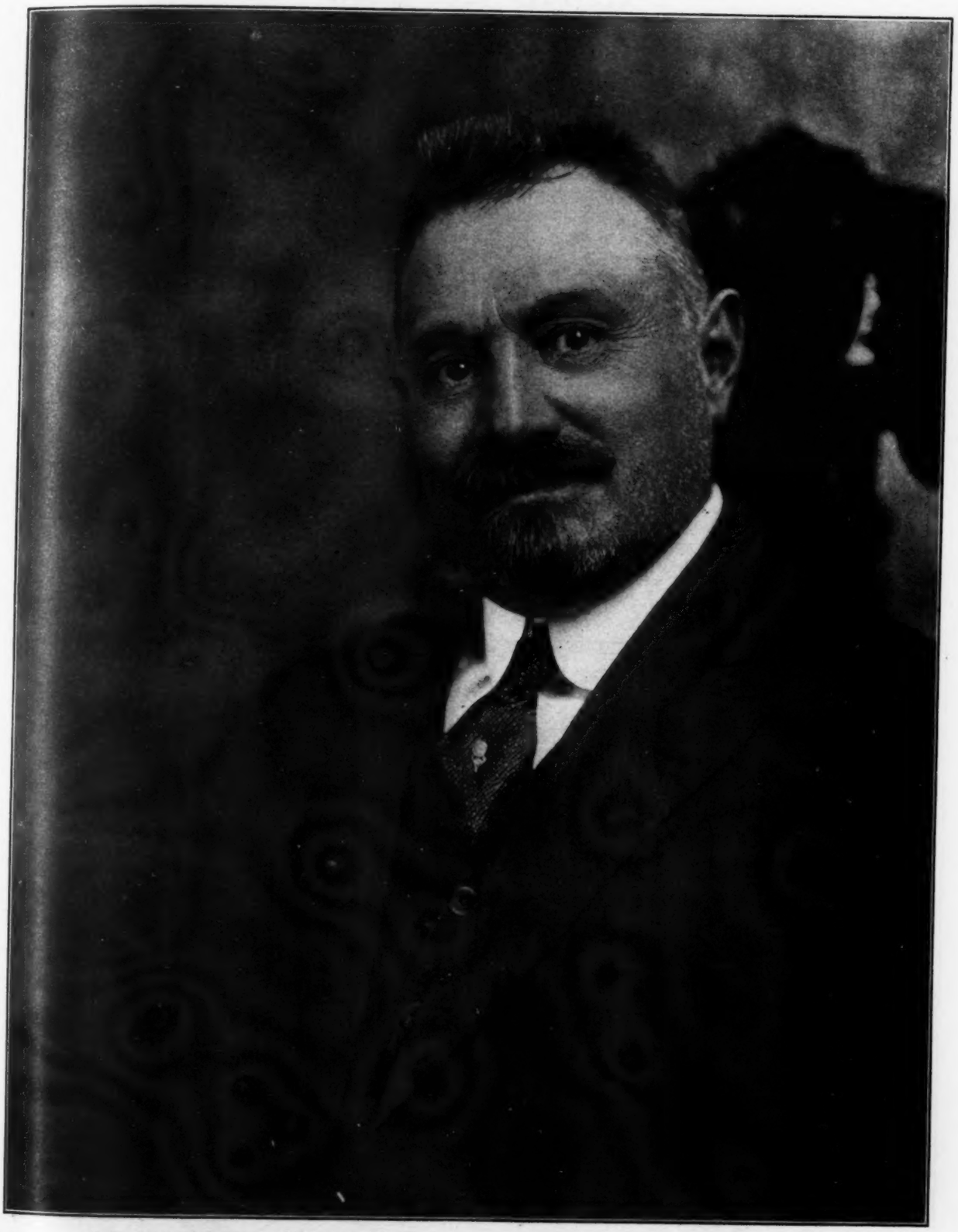
Speaking for the Commercial Section, I cannot allow this opportunity to pass without drawing attention to the splendid volume of investigations and reports prepared by the 14 committees and 13 sub committees who have had charge of Commercial Section work this year. Some of these reports cover subjects of vital interest which have never before been considered in this Section.

The activities of the Commercial Section have grown so rapidly during the past few years that it has been necessary to organize distinct bureaus such as the Lighting Sales Bureau, the Power Sales Bureau and the Industrial Heating Bureau; the work of these bureaus in themselves has developed so extensively as to require one or more separate sessions in order to afford adequate opportunity for the presentation and discussion of their reports. The rapid growth of the electric-range industry has necessitated such broad extensions of the work of the Electric-Range Committee that this committee in itself is practically as large as the aforementioned bureaus. Meanwhile the work of the Educational Committee has been continued along constructive lines and new courses have been offered and are under preparation in accounting, practical electricity, etc.

To Keep in Touch with Developments.

To adequately summarize the vast amount of practical and valuable work accomplished by the Commercial Section during the last administrative year would require more space than is now available. The work of the Commercial Section as at present conducted enters minutely and exhaustively into every detail connected with the commercial side of our industry and, by cross membership with other Sections, into all related activities in which commercial work is at all concerned with the technical and accounting side of the business. This work is performed cheerfully and gratuitously by busy men occupying responsible positions in their respective companies, whose services in this work are given at a considerable personal sacrifice. Under the new and changed conditions to which I have referred, this work will be continued, even though these necessary personal sacrifices may be greater than ever before. In general, the policy of the Commercial Section, at least for the immediate future, will be to watch with greater care than ever the developments in commercial work in all sections of the country; to study the best methods for developing intensive business to go on existing lines; to be on the alert for any and all opportunities which may present themselves for effective co-operation with the Association staff at headquarters and with other Association committees, and to hold ourselves in readiness to assume any new burdens or duties which may be assigned to us by the incoming administration.

War President of the N. E. L. A.



J. W. Lieb, Jr., Who Was Elected President of the National Electric Light Association Last week.

Low-Head Power Development at Prairie du Sac

Hydroelectric Plant of Wisconsin River Power Company, of 15,500 Kilowatts Capacity, Represents the Most Recent Practice in the Design of Low-Head Water-Power Developments

By H. W. YOUNG

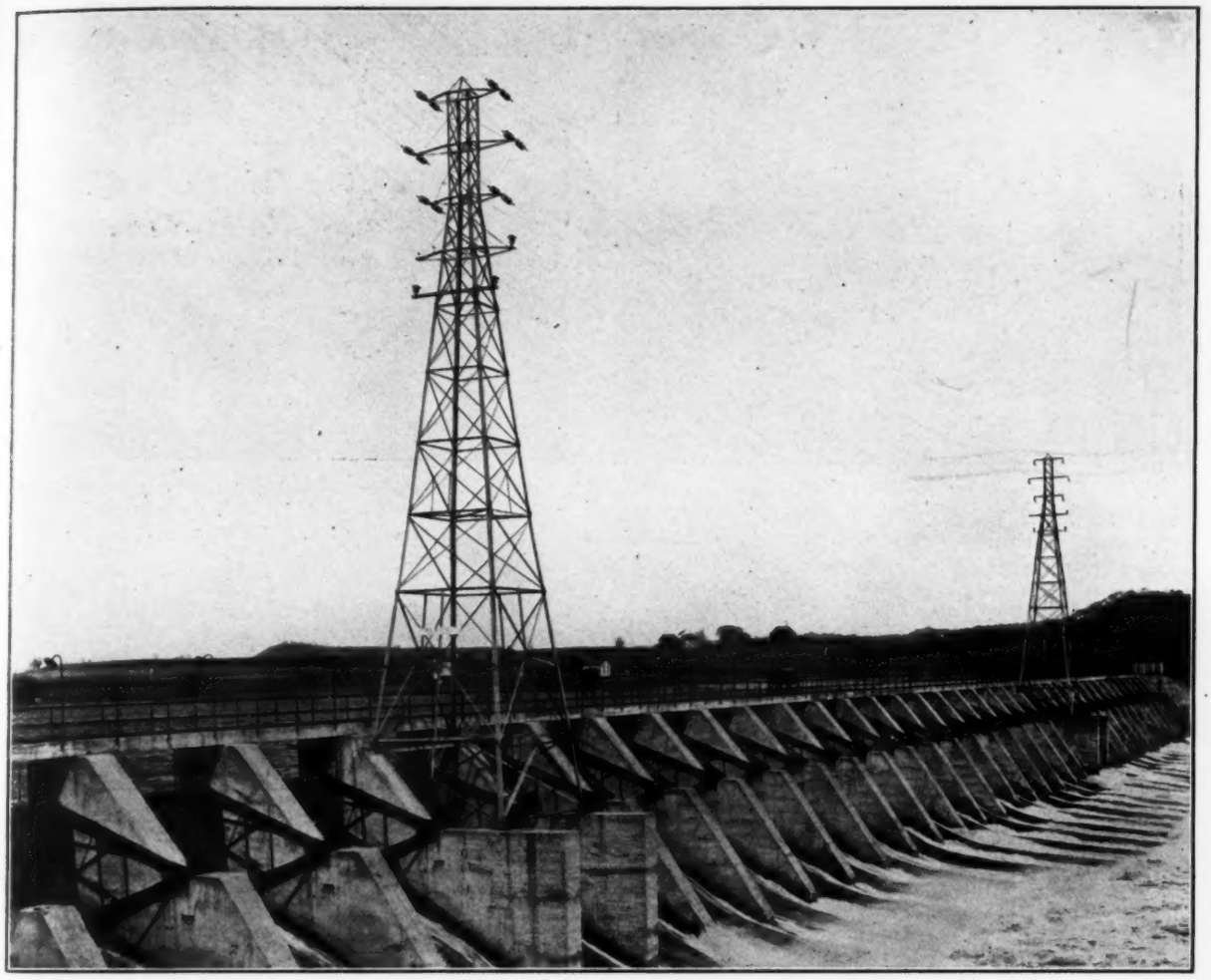
IN the development of the low-head water powers of this country lies a future full of wonderful possibilities. In not so spectacular a manner, perhaps, as in the case of mountain streams, whose waters are collected and dropped hundreds of feet in roaring jets; at the same time, with these low heads and an altogether different kind of engineering, power can be developed in as great abundance from the more placid rivers. Moreover, the slow-moving streams pass for the most part through regions more thickly populated, and where, within the limits of transmission, the power so generated may be utilized for more diverse purposes, with a higher "utility-factor," if it may be so termed, for the good of the community.

If the natural tendency to take the easiest first is any criterion, is would be fair to assume, also, that a higher degree of engineering knowledge is required to develop the larger of the low-head sites. It is certain, at least, that the solution of the problem of harnessing the great low-head powers came along a decade or more after the methods employed in controlling and utilizing the mountain stream had become standardized.

The State of Wisconsin owes its prosperity in a large measure to the utilization of its rivers—at first principally for the rafting of lumber, later for the development of the paper-mill industry, through water power, and finally for hydroelectric power. The upper stretches of these rivers, where the higher heads were available, were developed first, and as engineering methods progressed lower and lower heads were sought out and improved. Finally, far down on the lower reaches of the Wisconsin River, at the last gateway of the stream before it spreads out over the low country, the greatest power of the whole state, in fact the third largest in the Middle West, was developed. This is the hydroelectric plant of the Wisconsin River Power Company at Prairie du Sac, Wis. This plant has now been in operation for a period of two and a half years.

Three years of the hardest, and at times most disheartening, construction work ever attempted were necessary to get the river under control at this point. James O. Heyworth, the well-known hydroelectric engineer and contractor, of Chicago, is to be thanked for it. But that is a different story, which has been told before—a story full of dogged persistency, for the river was a veritable demon in spite of its gentle appearance, as it flowed over its 60-foot bed of shifting sands.

General View of Prairie du Sac Hydroelectric Plant of Wisconsin River Power Company.



Spillway Section of Dam and Electrically Operated Gates—Tower Line to Madison Above.

The total investment represented in the construction work and purchase of flowage rights was over $4,000,000.

Hydraulic Features.

The Wisconsin is the largest river in the state. It is approximately 300 miles long and drains an area of 12,280 square miles. In the space of five years prior to the building of the Prairie du Sac plant, hydroelectric engineering had been greatly perfected. The efficiency of such plants had been increased 15 per cent. Before that time the difference in the mean low-water flow and the flood flow of a river had never been given due consideration. The lack of sufficient spillways and adequate machinery to operate properly the flood outlets had endangered to a great extent all low-head water-power developments where these conditions of flow existed.

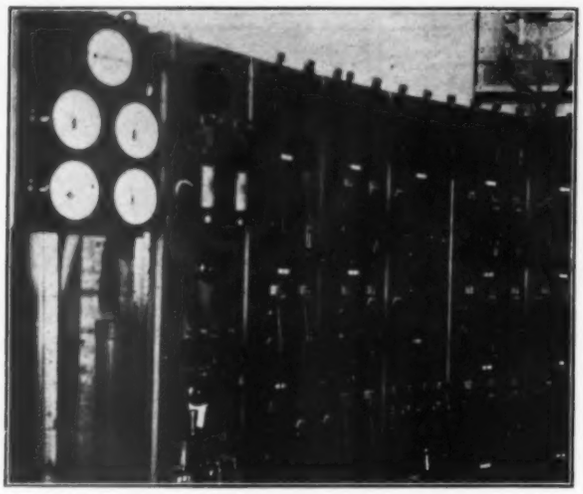
This important feature was provided for with great care at the Prairie du Sac plant, where the mean low-water flow is 5000 second-feet and the high-flood flow has reached 26,000 second-feet. This big difference has been taken care of by the installation of 41 Tainter gates, 14 feet high and 20 feet wide, placed on the top of the spillway section of the dam. This permits control, for the best interests of the power, of all stages of floods, and has a very important bearing on the present successful operation of the plant.

The plant consists of five elements. At the west bank stands the power house, 330 feet long; next to it the log and ice chute, 38 feet wide; then a lock 35 feet wide, and finally the spillway and an abutment embankment, together 1700 feet long.

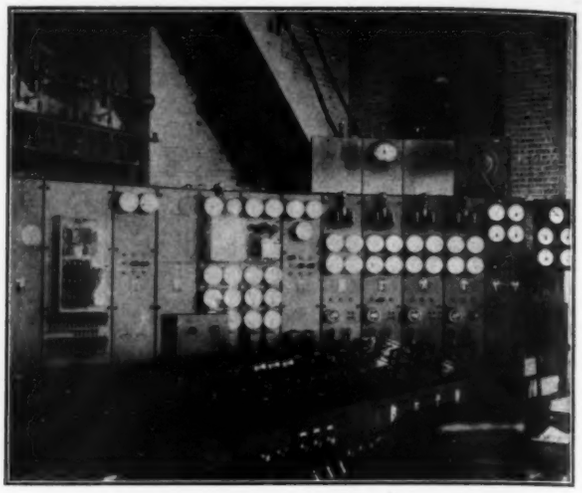
The present normal head utilized is 28 feet, which is maintained as nearly as possible the year around, by means of the controlling gates mentioned. In times of flood water, however, this is somewhat decreased by the backing up of the water in the tailrace. The loss of head for this reason is sometimes as high as eight or nine feet. The present capacity is 15,500 kilowatts, but with two more generators, which may be added to the present plant, the ultimate capacity at this head is 21,500 kilowatts. When the market for power has been sufficiently developed to warrant the additional cost of construction and purchase of flowage rights, the dam may be heightened to secure a head of 34 feet, increasing the ultimate capacity to 28,000 kilowatts.

Power-Plant Installation.

Six generating units are at present in operation in the plant. Four of these are 25-cycle three-phase generators of 2500 kilowatts capacity each. Three of them are shown in the foreground of the interior view. They deliver current which is stepped up to 66,000 volts, carried by transmission line to Portage, Wis., there delivered to the transmission line of the Southern Wisconsin Power Company and carried on to Watertown, where the energy is sold to the Milwaukee Electric Railway & Light Company, being carried over the latter's line to Milwaukee from that point. The reason that 25 cycles was employed was to conform to the frequency of the Kilbourne plant of the Southern Wisconsin Power Company, built some years earlier, when 25-cycle practice was more



Lighting and General Power Panels.



Instrument Panels and Benchboard.

common, and so be able to use the Portage-Watertown-Milwaukee line in common with that plant.

The farthest two generators in the illustration are 60-cycle units, one of 3000 and the other of 2500 kilowatts capacity, which furnish energy to Madison, Wis., and a number of small towns. The third unit from the farther end is not in operation, being a 25-cycle unit for which there is no need at present, and it is simply occupying one of the two spare spaces where additional equipment may be put in later.

The 25-cycle generators are each driven by horizontal turbines of 3600 horsepower under a 32-foot head. All the turbines as well as the generating apparatus are of Allis-Chalmers make. The gates of these turbines are controlled by a traveling ring, in turn controlled by a hydraulic governor through oil pressure. There is a double-action valve in the main oil line. The normal speed of the unit is 107 revolutions per minute. When the load increases and the speed starts to drop, the governor closes one of the ports partially and oil is admitted to the other side of the piston at the same time. This operates to open the gates of the turbine. The action is much the same in principle to that of an air-brake system.

The turbines for the 60-cycle sets are of the same type and capacity, being automatically controlled in the same manner. In all the units the exciter sets are mounted on the generator shaft as shown in the illustration.

Two centrifugal pumps deliver the oil for controlling the turbine gates to two-pressure tanks, and are driven each by a 40-horsepower, three-phase motor. For greasing the bearings of the turbines a line of pipe runs the length of the building. Grease is forced into this pipe under 200 pounds pressure by means of a hand-operated press. As frequently as necessary the valve in the grease line to each bearing is opened and the bearing given a "shot" of grease.

On the ground floor are also two motor-generator sets for supplying the current necessary for operating the switching devices. The generator end of each is of 15 kilowatts capacity. These furnish the current for operating both the low and high-tension switches, through remote control from the switchboard gallery. On the shaft between motor and generator is a heavy fly-wheel which will continue to run for 25 to 30 minutes if for any reason the motor end should be "kicked" out of the line. This insures a source of current supply for the operation of the switches for a period to bridge over any ordinary line disturbance.

In the layout of the station line surges have been prepared for, as far as choke coils can be made effective for the purpose. A sufficient degree of flexibility is also provided in the connections and switching apparatus to provide for any contingency of the service.

The low-tension switches and buses are all on the first floor of the building—the floor on a level with the switchboard gallery above the generator pit. On the second floor are the transformer high-tension oil switches. On the third floor are the line switches, Westinghouse air-cooled instrument transformers and Westinghouse electrolytic lightning arresters. All the high-tension wiring is carried vertically through concrete shafts, under the ceilings of the respective rooms to a point over the switching devices, which in all cases are in the middle of the room and carefully protected by strong screens. The high and low-tension switches on the 60-cycle side are Westinghouse and on the 25-cycle side Pacific Electric. The switching is all controlled from a bench board in front of the main switchboard at a point where every part of the generator room is under observation. The transformers are located in separate compartments opening out on to the gallery, which runs the full length of the generator room and can be shut off from the gallery by steel fire doors. These are Westinghouse water-cooled, air-insulated transformers on the 60-cycle line, 2300-3300-volt, 4500 kilowatts each; on the 25-cycle line, General Electric 2300-6600 volts, rated at 2800 kilovolt-amperes each. Three of the last named are in regular service, with one as a spare. All have a grounded neutral.

Between the transformers and generator oil switches are choke coils for the protection of the generators against surges. These coils are 15 inches in diameter, with 21 turns of one-inch-diameter copper.

On the 25-cycle line there is a bus connection on the high-tension side of the transformers. This, together with the generator bus, permits any combination desired. There is also a ground switch between the high-tension bus and the transformers.

The arrangement is much the same in the case of the 60-cycle line, the tie switch taking the place of the transformer bus and a double generator bus being employed.

The accompanying illustrations of the switchboard show it "flattened out," so to speak. In reality it stands in practically a half circle in the switchboard gallery, but the narrowness of the space prevented getting the proper perspective into the photograph. Its equipment is practically all standard Westinghouse apparatus, the indicating instruments being on the front and the recording instruments on the back. Above and to the rear are the Cutler-Hammer generator field rheostats, operable from the front of the board. There are 28 panels besides the swinging synchronizing panels at each end.

The first panel at the left is for the two motor-generator sets previously described, which furnish switching current.

The two solenoid relays at the top are for added protection to insure continuity of this current supply, in case of emergency. In case lightning or other line disturbance trips out the motor-generators, the relays automatically act to throw the field-exciter current on the switching line.

The other panels of this group, constituting one half of the board, are for the station lighting supply, station auxiliary power, operating the Tainter gates and for service to neighboring small towns. The other group, as before mentioned, comprises the panels for the indicating instruments and are standard in every way.

Distribution System.

Three distinct classes of service are now being furnished by the Wisconsin River Power Company. First come the two large bulk customers, namely, the Milwaukee Electric Railway & Light Company and the Madison Gas & Electric company, of Madison, Wis. The former averages 100,000 kilowatt-hours a day and the latter approximately 40,000 kilowatt-hours a day, which represents practically the entire consumption in Madison at the present time.

The second class of service is that supplied to small towns in the vicinity of the plant. One of these lines extends to Prairie du Sac and Sauk City, about two miles (2300 volts, three-phase, 60-cycle). Another to Lodi, some 14 miles, carried on the Madison line towers and operating at 2300 volts. There is also a line from Lodi to Waunakee, operating at 4400 volts and fed from the Madison line through a substation at Dane, midway.

Altogether, this small-town service now represents an output of about 70,000 kilowatt-hours a month.

The third class of service alluded to is that supplied to farmers' lines. It will be the aim of the company to develop as fast as possible this and the small-town service. A better rate can be obtained from both than can be obtanied in the case of the bulk users, where efficient plants already exist and the rate made has to be even lower than the generating cost at these plants. At the same time the farm and small-town rate represents extremely low current cost for these communities, and brings the advantages of electric light and power within the reach of all.

Farm business thus far has not been a factor of consequence, the only service having been furnished from the Lodi line, the farmers buying their own transformers and building individual lines.

Within the last few months, however, farmer companies have been formed and actual work begun in two instances, and it is expected that others will follow in rapid succession in this section much after the manner of the development of farmers' telephone lines.

Farmer Companies.

The first of these companies to be formed was the Sumpter Light Company. One day a tall, big-fisted man walked into the local office at the power plant and asked for G. C. Neff, who is the general superintendent of the company. Upon meeting that gentleman he asked: "Do you people furnish current?" "We do." "Well, is there any reason why you won't furnish it to us fellows up in Sumpter?" "No." "All right, then, we want it." That was about all there was to the conversation and the tall man walked out.

A few days after that the "Sumpter fellows" had formed a company. Each man took one share of stock at $200. The tall man, whose name was Fred Waffenschmidt, was the president, and they were ready to do business.

A contract was made with the power company to deliver energy to the line which the Sumpter company would build, at a stipulated point, at a stipulated price per kilowatt-hour.

Next they had to have some poles—and anyone who has found it necessary to lay his hands on poles of any kind during the winter and spring of 1917 knows what they were up against. But the tall man figured he could get some poles somewhere, so he got on the train and did not stop going until he found them. Then he stayed right with those poles until they landed in Prairie du Sac.

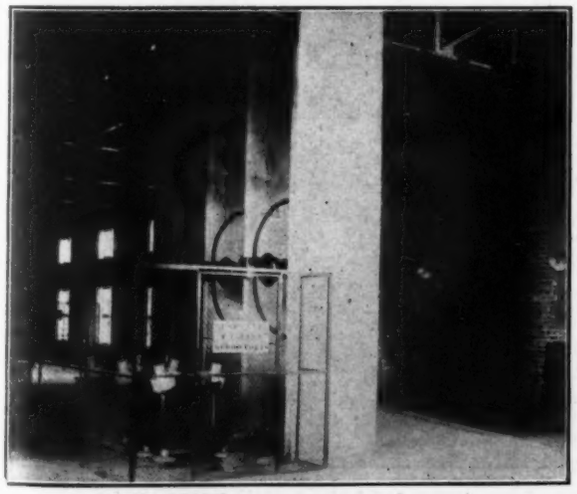
The farmers got together and set the poles in short order—they were 25 feet, six-inch tops, with two pin cross arms. They bought No. 4 galvanized iron wire, three-stranded, for the 6600-volt, three-phase transmission line and No. 6 iron wire for the laterals. This cost them 7.5 cents a pound, against 40 cents for copper at the time, and the iron ought to be good for 20 years. They also bought their own transformers and meters.

The transmission line is built now and the houses of the company members nearly all wired.

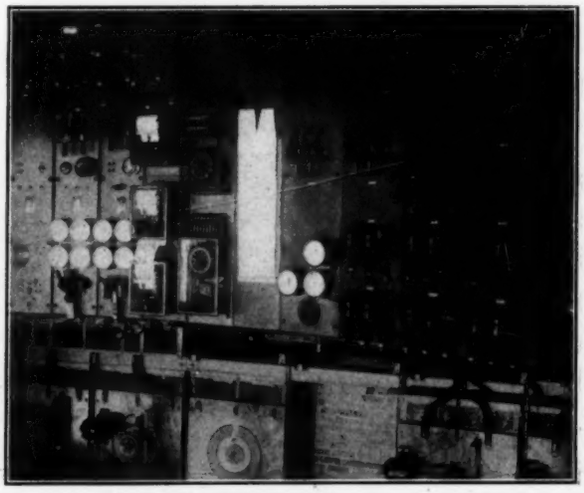
Inasmuch as the line was theirs and they built it themselves, that old, vexatious question of tree trimming and cutting did not become a bugbear to the power company, as it would have if the latter had built the line. The matter automatically became the farmers' own business and they handled it manfully. One row of great 16-inch maples in particular, 40 rods long, went up into cordwood almost over night.

In fact, this seems to be the ideal way of furnishing service to the farming communities; that is, to form small companies in this manner and have them build their own lines, the power company selling the current in bulk to the group comprising the company.

To the northward of the power site are the cities of Baraboo, Portage, Beaver Dam and Berlin. A company called the Wisconsin Power, Light & Heat Company has been



Transformer Oil Switches for the 66,000-Volt Portage Line.



Totalizing Panels.

formed to serve them with energy from the Prairie du Sac plant. A steam plant at Portage is also contemplated, to work in parallel with it. The Prairie du Sac-Baraboo line will go in this summer. Taking advantage of this fact, another group of farmers got together and formed the Sauk Prairie Light & Power Company, capitalized at $10,000. A substation will be erected on the Baraboo line at the load center of this group and the farmers will build their own lines from this substation after the manner of the Sumpter Company.

High-Tension Transmission Lines.

The 66,000-volt line to Portage is carried on standard four-posted steel towers, with 14-foot base, made by the American Bridge Company. These are 50 feet high and spaced on the average 625 feet apart. They are set in concrete.

The circuits are in duplicate, No. 0 stranded copper cable. These cables are carried by four Ohio Brass Company suspension insulators on the straight runs, with five at strain points. The two circuits are 12 feet apart and the conductors of each line are spaced vertically, six feet apart. A ground wire is carried above each circuit at a distance of eight feet.

The cost of the line, which was built in 1914, averaged $5500 a mile and it is 22 miles long.

The Madison line, built a year later, is about 28 miles long and cost on the average $5700 a mile. Its design is somewhat different.

Four-cornered towers are here employed, with a 10-foot base and 50 feet high, with an average spacing of 600 feet. The type of tower used is well shown in one of the illustrations where the line crosses the waste gate end of the dam.

In this case the conductors of the two circuits of the 33,000-volt line are of reinforced aluminum cable equivalent to a No. 1 copper conductor. Thomas suspension insulators are used, three on the straightaway portions and four at strain points. The conductors do not hang one above the other, the middle one being suspended two feet farther from the tower than either the top or bottom one. This method of suspension eliminates much of the trouble during sleetstorms, or rather from the thawing of the ice on the cables. While the ice is on the line the weight is evenly distributed among the various spans. But the thawing does not occur uniformly, and if the load is relieved between certain towers before it is from neighboring spans the latter sag more than normally by drawing the suspension insulators together. Less trouble is encountered with the staggered arrangement, for in the former case it is impossible for the conductors to come together or approach near enough for arcing to occur.

Only one ground wire is used on this line, on the point of the tower. The line on the lower cross arms in the illustrations is the 2300-volt line to Lodi, previously alluded to.

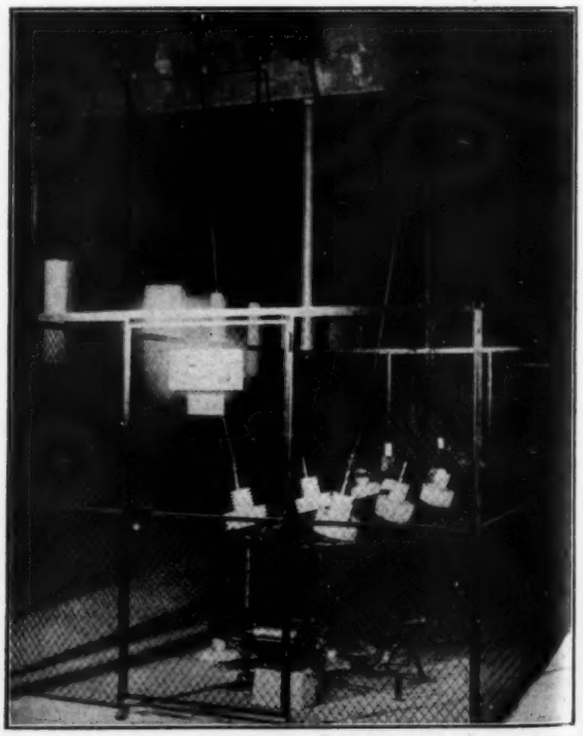
Continuity of Service.

The question of the reliability of service from the Wisconsin Power Company has been raised in Madison. Whether or not a steam reserve should be maintained there is being discussed and the State Department of Engineering is making a study of the situation. In a preliminary report by the Department, some interesting facts were accumulated in regard to outages.

Various hydroelectric companies throughout the United States and Canada, operating under similar conditions, contributed data on this subject and it was found that the Wisconsin River Power Company had been particularly fortunate in this respect as compared with other companies. Since November 29, 1915, when Madison began receiving energy, no outages or interruptions of great length have occurred. There were three during the first month of operation, varying from three to five minutes, due to trouble in the power plant; two varying from one to two minutes occurred as a result of transformer trouble; one interruption of 35 minutes was due to trouble in the battery leads of the Madison Gas & Electric Company's plant; one interruption of 13 minutes was from trouble unknown, which caused the Madison Gas & Electric Company set to drop out of step.

A serious outage was approached at one time during a sleetstorm when one of the transmission lines was out of

Generators in the Prairie du Sac Hydroelectric Plant.



Line Oil Switches and Instrument Transformers for the 66,000-Volt Portage Line.

commission for a period of 36 hours and 38 minutes, but the other line carried the load safely.

ADVANTAGES TO THE COMMUNITY.

The Wisconsin River Power Company was originally formed by Magnus Swenson, of Madison. Control, however, later passed to John I. Beggs, and the executive offices are in Milwaukee. The same interests also control the Southern Wisconsin Power Company, with a plant at Kilbourn, near the famous Dells of the Wisconsin, and also the Wisconsin Power, Light & Heat Company before mentioned.

The good derived from a development of a power such as this, in the heart of a thickly populated, prosperous state, is not to be measured alone in costs per kilowatt-hour. Planting in the midst of such a community a $4,000,000 plant of this kind has been a matter of interest to thousands and exerted a quickening influence that is quite evident.

With plenty of electricity brought into their dooryards, about the last of the so-called big city conveniences is now at the immediate disposal of the farmers and townspeople. They probably know more already about kilowatts and amperes, transformers and three-way switches, etc., than does the average city dweller who persistently remains for the most part in blissful ignorance of these things, with the possible exception of the "fast-running" meter.

The electric wiring contractor comes to life, developed on the spot from the local plumber. Washing machines, motors and electric irons are going into the homes. Elaborate electric fixtures are being bought to beautify these homes. And in a hundred other ways newer and better ideals of living are fostered.

Above the dam and power plant lies Lake Wisconsin, which was not there three years ago. The water has backed up between the wooded hills almost to the city of Portage. A large number of the farmers and people of the towns are building summer cottages, and those whose land runs down to the lake are doing a thriving real-estate business.

And so in many ways a stimulus of much importance in the community results from the harnessing of the river.

Mead & Seastone, of Madison, Wis., were the consulting engineers for the Prairie du Sac plant.

MEDAL OF HONOR TO BE AWARDED BY INSTITUTE OF RADIO ENGINEERS.

Washington Section of Institute Honors General Squier at Patriotic Testimonial Dinner.

The Board of Direction of the Institute of Radio Engineers has decided to award annually a "Medal of Honor" to such persons who have distinguished themselves by unusual advances in the fields of radio telegraphy and telephony. It has been felt that some way should be found whereby valuable work in these fields of great and rapidly growing importance might properly be recognized by an authoritative engineering society. As is well known, the Institute of Radio Engineers with more than 1000 members here and abroad, and with sections in New York, Washington, Boston, Seattle, San Francisco (with others in contemplation), is the leading technical and scientific society in the wireless field. It is therefore recognized that a "Medal of Honor" from the Institute will be a goal worthy of attainment by any investigator.

The medal is the work of the well known sculptor, Edward Sanford, Jr., of New York.

The award will be made yearly at the April meeting of the Institute to the person who, during the two preceding calendar years, shall have made public the greatest advance in the art of radio communication. The advance may be a patented or unpatented invention, but it must be completely and adequately described in a scientific or engineering publication of recognized standing and must be in actual, though not necessarily commercial, operation. However, preference is to be given to widely used and widely useful inventions. The advance may also consist in a scientific analysis or explanation of hitherto unexplained phenomena of distinct importance to the radio art, although the application may not be immediate. Preference will be given to analyses directly applicable in the art. In this case also publication must be full and in approved form.

THE WASHINGTON SECTION MEETING.

The spirit of co-operation that finds science united for the protection of the nation as it goes to war was eloquently foreshadowed at the dinner tendered on March 3 to Brigadier General George O. Squier by the Washington Section of the Institute. An assemblage representative of the highest engineering skill in the art of wireless communication mentally and orally dedicated itself on this occasion to making available to the Government a system of radio unsurpassed, and even unequaled, throughout the civilized world.

Lieut. Commander S. C. Hooper, to whom is given a large proportion of the credit for the reorganization of the Navy's radio system and the installation of efficiency methods, began the addresses of the evening with an appreciation of the manner in which the workers in the wireless field had made ready industrially for preparedness of a high order. It was significant of the times, he said, that this newest of arts had a material representation in manufacturing circles and it was inspiring to know that the serious situation had effected a whole-souled mobilization of production effort for the mechanical equipment of the Navy. As to valuable personnel to be drawn from the field, he felt certain that quick response would be made to the call to the colors, with such anticipated acceleration in fact, that he hoped to make it understood that the nation's best interests would be served if the engineers would remain in their places as producers of equipment, allowing the less skilled workers who had not reached the plane of scientific standing to go to the front for the execution of the actual communication.

George H. Clark, expert radio aid for the Bureau of Steam Engineering of the Navy Department, echoed these sentiments in an after-dinner speech that carried an eloquent appreciation of the contributions to science of General Squier, the guest of honor, and Lee de Forest added a further testimonial on the cable inventions of the scientist soldier.

Further inspiration to effort was added by H. E. Knight, a patent attorney, who gave unstinted praise to the men who had set aside the isolation of the sea. A contribution of a more efficient type of apparatus so that ships and men at sea could be instantly controlled by the naval strategist, he characterized a more valuable gift than another $10,000,000 battleship.

An ovation marked the introduction of the guest of the evening, and General Squier responded immediately with a message of inspiration that pointed out a double incentive for every engineer present. The keynote of his address coincidentally lay in the toast carried on the menu, entitled "To the Radio Engineer of Tomorrow."

Chicago Telephone Move Orders Exceed Records.—The number of telephone move orders handled by the Chicago Telephone Company during what is known as the "May moving period" was approximately 43,000, part of this total being estimated, because all of the move orders have not yet been completed. The number of move orders handled during the same period last year was 36,300, while in 1915 the number was 33,000. The volume of traffic over the lines of the telephone company is the heaviest in its history and is due largely to the extraordinary activity which prevails in all lines of business. During the first three months of the present year the number of telephones installed by the Chicago Telephone Company exceeded the number installed during any similar period in the company's history.

Single-Phase Motor Construction and Characteristics

Second Half of an Article Dealing with the Distinctive Features of the Various Classes of Single-Phase Motors--- Repulsion, Repulsion-Induction, Series and Special Types

By H. WEICHSEL and TERRELL CROFT

THE REPULSION MOTOR (classification 2*c* in the table given in the first half* of this article) has, as illustrated in Fig. 12, an armature which is like that of a direct-current machine. Short-circuiting brushes E_1 and E_2 that are inclined at an angle to the axis of the stator winding are provided. A machine of this type has in general the same speed-torque characteristics as a direct-current series motor, that is, high starting torque with a very small starting current and rapidly decreasing torque with increasing speed. The power-factor of this machine increases with increasing speed and near synchronous speed attains a value which is higher than usually obtained in straight induction motors. These motors are used principally for constant-torque applications, namely, for printing-press drives and also for other drives for which series direct-current motors are adaptable, such as for fans and blowers. They have been successfully applied for hoist service.

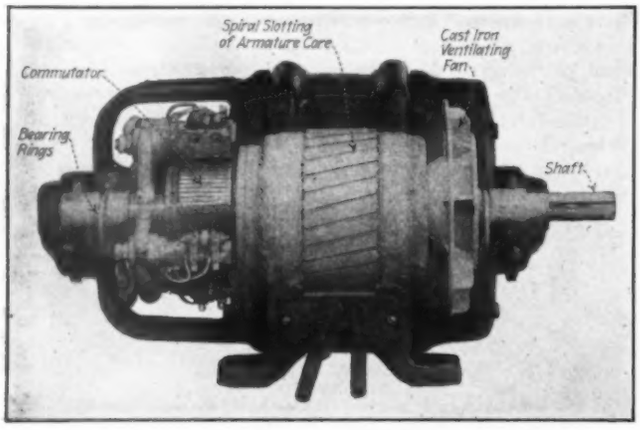


Fig 11.—Phantom View of General Electric Type R I Single-Phase Motor.

As with the series direct-current motor, the speed of these machines can be varied by varying the impressed voltage or by shifting the brushes. The direction of rotation of a straight repulsion motor can be changed by the addition of a suitable reversing switch or reversing winding, or by shifting the brushes to the reverse side of the neutral.

The Repulsion-Induction Motor.

The repulsion-induction motor (classification 2*d* in the table) Figs. 11 and 13, is like the straight repulsion machine except that in addition it has a compensating winding as shown in the diagram. The energy brushes E_1, E_2, E_3 and E_4 have approximately the same angular position in relation to the stator winding as the energy brushes of a straight repulsion motor. These machines have, in addition to the energy brushes, a second set of brushes C_1 and C_2, called the

*Electrical Review and Western Electrician, May 12, 1917, pages 796-799.

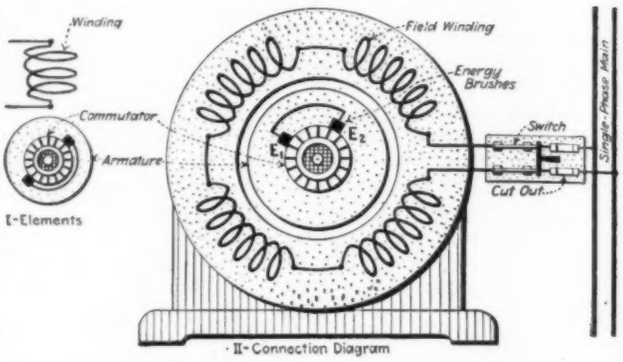


Fig. 12.—Diagram of Straight Repulsion Motor.

compensating brushes, which are connected in series with the compensating winding as shown.

These motors have a starting torque equal to about two times full-load torque with approximately twice full-load current. The maximum torque is about from two and one-half to three times full-load torque. The power-factor (due to the corrective action of the compensating winding) is very high at all loads, but the efficiency of this machine is lower than that of the induction motor. Single-phase motors of this type are well adapted for loads involving heavy starting torque and sudden overloads. They have the disadvantages of having commutators which carry the total armature current. They can be arranged for variable-speed service, as shown in Fig. 14, by the insertion of a rheostat in series between the energy brushes. They can also be arranged for reversing service, as indicated in Fig. 15, by the application of a reversing field and a suitable reversing switch. The characteristic performance graphs of machines of this type are shown in Fig. 16.

If a variable-speed single-phase motor is required, some modified form of repulsion-induction motor (Fig. 14) can be

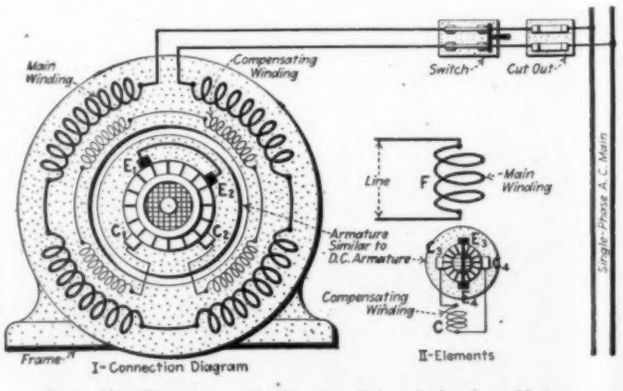


Fig. 13.—Diagrams of the Repulsion-Induction Motor.

Note.—The brushes E_3 and E_4 in diagram II should be slightly inclined against the main winding.

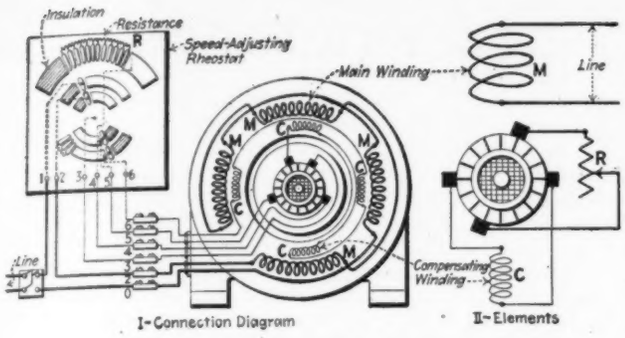


Fig. 14.—Variable-Speed Repulsion-Induction Motor and Controller.

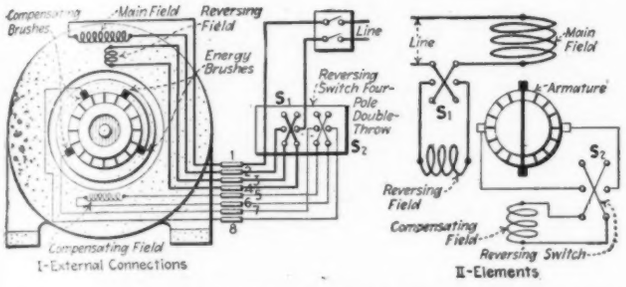


Fig. 15.—A Repulsion-Induction Motor Arranged for Reversing Service.

On throwing the reversing switch, S_2 reverses the connections between the compensating winding and the compensating brushes, while S_1 reverses the connections between the reversing-field winding and the main winding.

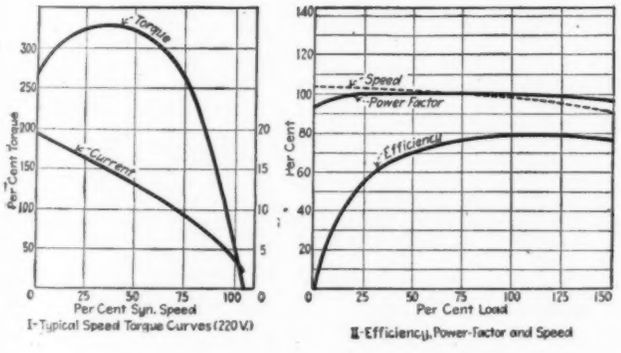


Fig. 16.—Typical Performance Graphs for a Single-Phase, Repulsion-Induction Motor (General Electric Type R I, Form C).

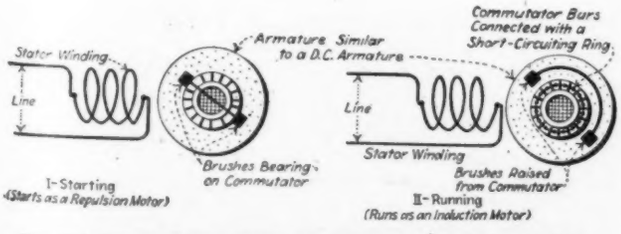
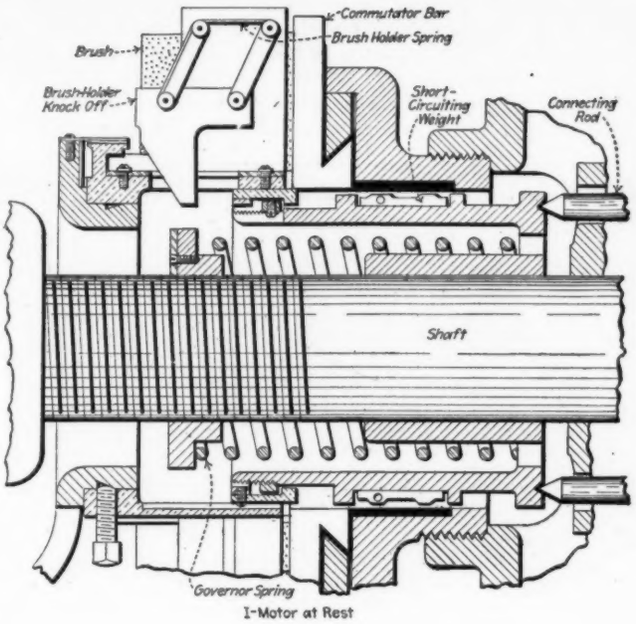

Stator Winding
Line
Armature Similar to a D.C. Armature
Brushes Bearing on Commutator
I-Starting (Starts as a Repulsion Motor)
Commutator Bars Connected with a Short-Circuiting Ring
Brushes Raised from Commutator
II-Running (Runs as an Induction Motor)

Fig. 17.—Diagrams Illustrating the Principle of the Repulsion-Starting-Induction-Running Single-Phase Motor.



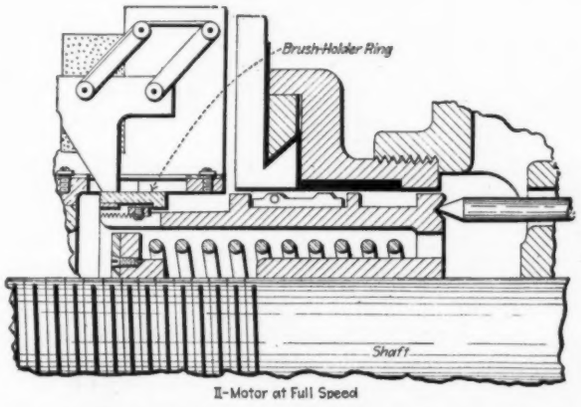


Fig. 18.—Illustration of Mechanism of the Brush-Lifting and Commutator-Short-Circuiting Device on the Wagner Repulsion-Starting and Induction-Running Motor.

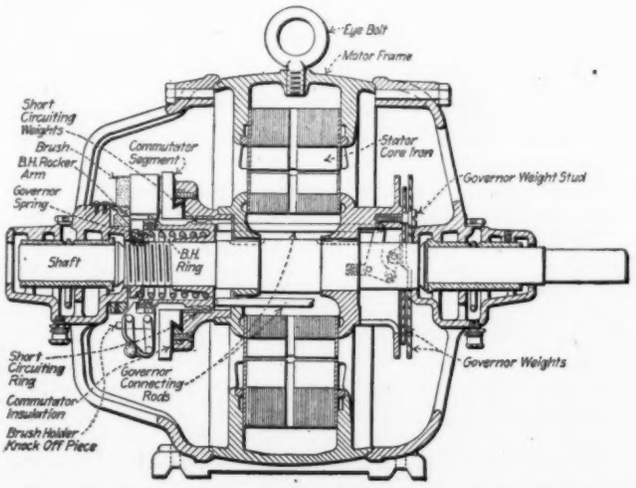


Fig. 19.—Sectional Elevation of Wagner Type BA Repulsion-Starting and Induction-Running Motor.

used. Also the series motor (Fig. 22) and the straight repulsion motor (Fig. 12) may be applied for this service by using a rheostat or an autotransformer in the line for varying the voltage impressed on the motor terminals.

The behavior of such motors is similar to that of the variable-speed wound-rotor multiphase-induction motor with

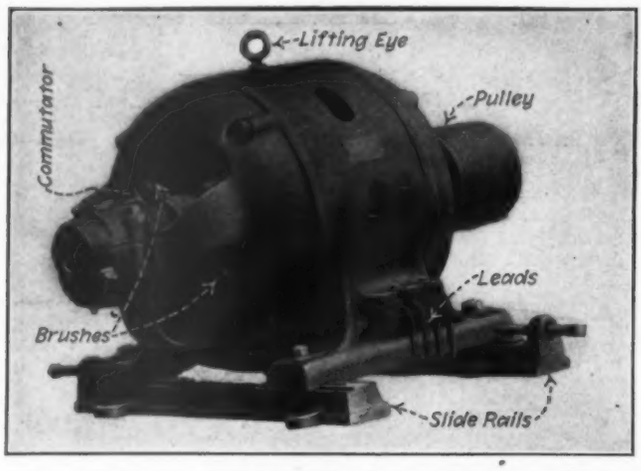


Fig. 20.—External Appearance of Wagner Type BA Repulsion-Starting-Induction-Running Motor.

resistance in series with the rotor. They are consequently, owing to their unstable speed characteristics, suited only to such applications as require a steady horsepower at given speeds. Their characteristics as regards starting torque, etc., are unchanged when used for variable speeds. The speed-regulating resistance (R, Fig. 14) is in one type of motor inserted in series with the brushes, which are normally short-circuited, and the insertion of additional resistance decreases the speed.

Repulsion-starting, induction-running, single-phase motors (classification 3 in the table) are now probably used for power service to a greater extent than those of any other type. As would be inferred from its name, the motor starts as a repulsion motor but operates as an induction machine; its principle is shown in Fig. 17 and a complete motor in Fig. 20. The rotor, Fig. 19, is exactly the same as the armature of a direct-current motor. It is provided with form-wound coils and a commutator. The number of brushes used is the same as would be used with the corresponding direct-current motor with the same number of poles, but in the alternating-current machines all of the brushes are connected together electrically by the metal rocker arm which supports them. The stator, which has only one winding, is supplied with single-phase current. There is no electrical connection (Fig. 17) between the stator and the rotor. The currents in the stator create an alternating flux which reacts on the rotor and induces its rotation. When the speed of the rotor approaches synchronous speed, a centrifugal device of some description short-circuits the commutator bars (Fig. 18-II and Fig. 19) and simultaneously pushes the brushes away from the commutator. Thus the motor is transformed into an induction machine having what is essentially a squirrel-cage rotor.

Typical performance graphs are shown in Fig. 21. The machine is inherently a constant-speed motor. The applications of the repulsion-starting, induction-running motor are about the same as those for which a direct-current constant-speed motor is ordinarily used, with the differences that the repulsion-starting, induction-running motor has a much greater starting torque (Fig. 24) than the corresponding shunt motor and that it is not adaptable for adjustable-speed service.

The series single-phase motor (classification 4 in the table) comprises, Figs. 22 and 23, merely an armature of the same construction as any direct-current armature in series with a field winding. In fact, any direct-current series motor will operate on single-phase alternating current, but if the machine is of such a capacity that it requires considerable current, commutation difficulties will be encountered. Furthermore, for alternating-current work the stator core should be laminated. However, for motors of small capacity where the currents are of low intensity, the commutation difficulties are not unsurmountable. Hence small single-phase series motors are being manufactured and used successfully in capacities of less than one horsepower. The important commercial example of this type of motor is the so-called "universal" motor which will operate on either direct-current or alternating-current circuits. It is used for fans and small appliance motors and electric drills, where the manufacturers in sending out the motor may not know whether the ultimate purchaser will have available alternating current or direct current. These are variable-speed machines, that is, they have (approximately) the speed-torque characteristics of a direct-current series motor.

Single-Phase-Motor Calculations.

To compute either the horsepower, current, voltage, power-factor or efficiency of any single-phase alternating-current motor, the other quantities being known, one of the following formulas may be used:

(1) $h.p._o = E \times I_1 \times p.f. \times \eta / 746$ (horsepower).
(2) $E = h.p._o \times 746 / (I_1 \times p.f. \times \eta)$ (volts).
(3) $I_1 = h.p._o \times 746 / (E \times p.f. \times \eta)$ (amperes).
(4) $p.f. = h.p._o \times 746 / (E \times I_1 \times \eta)$ (power-factor).
(5) $\eta = h.p._o \times 746 / (p.f. \times E \times I_1)$ (efficiency).

wherein $h.p._o$ = power output of the motor in horsepower, E = alternating voltage impressed between the wires on motor terminals in volts, I_1 = current taken by the motor in amperes, $p.f.$ = power-factor of the motor expressed decimally, η = efficiency of the motor expressed decimally.

Example 1.—What will be the horsepower output of the pulley P of the single-phase motor shown in Fig. 25, when the impressed voltage is 220, the current is 10 amperes, the

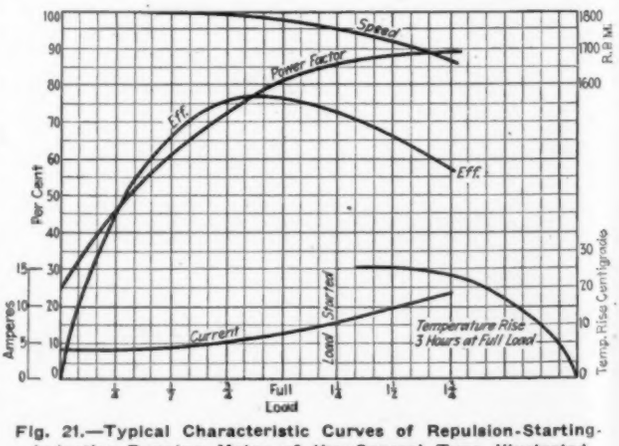


Fig. 21.—Typical Characteristic Curves of Repulsion-Starting-Induction-Running Motor of the General Type Illustrated in Fig. 17. (Peerless Electric Company).

power-factor is 84 per cent and the efficiency is 80 per cent?

Solution.—Substitute in formula (1)

$h.p._o = (E \times I_1 \times p.f. \times \eta) \div 746$
$= (220 \times 10 \times 0.84 \times 0.80) \div 746$
$= 1{,}478 \div 746 = 1.98$, or, say, 2 horsepower.

That single-phase motors may be operated from any alternating-current circuit is their principal advantageous feature. Obviously they may be operated from a single-phase circuit and can also be operated from two-phase and three-phase circuits, as diagrammed

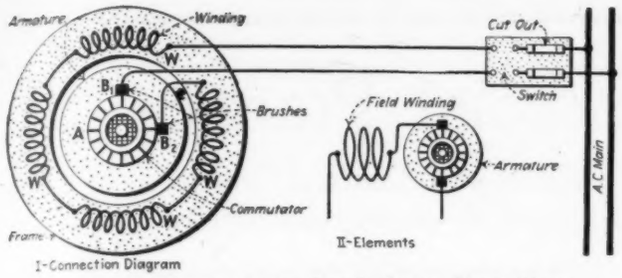
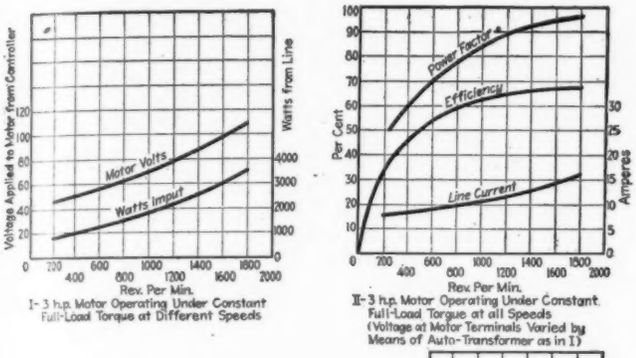
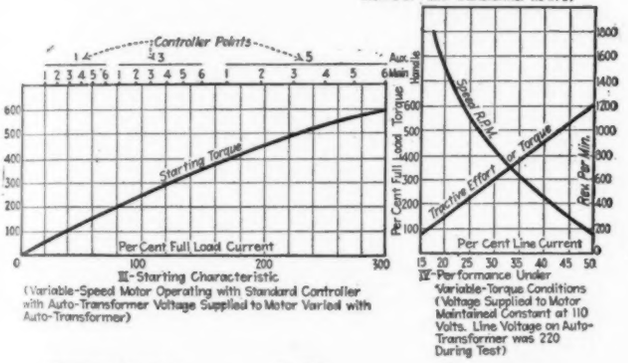


Fig. 22.—Diagrams of the Simple Series Single-Phase Induction Motor.

This type of motor is commonly called the "universal" motor because it can be used interchangeably on direct-current and single-phase circuits.


Voltage Applied to Motor from Controller
Watts from Line
Motor Volts
Watts Input
Rev. Per Min.
I- 3 h.p. Motor Operating Under Constant Full-Load Torque at Different Speeds
Per Cent
Amperes
Power Factor
Efficiency
Line Current
Rev. Per Min.
II- 3 h.p. Motor Operating Under Constant Full-Load Torque at all Speeds (Voltage at Motor Terminals Varied by Means of Auto-Transformer as in I)


Controller Points
Aux.
Main
Starting Torque
Per Cent Full Load Current
III- Starting Characteristic
(Variable-Speed Motor Operating with Standard Controller with Auto-Transformer Voltage Supplied to Motor Varied with Auto-Transformer)
Per Cent Full Load Torque
Speed R.P.M.
Tractive Effort or Torque
Rev. Per Min.
Per Cent Line Current
IV- Performance Under Variable-Torque Conditions (Voltage Supplied to Motor Maintained Constant at 110 Volts. Line Voltage on Auto-Transformer was 220 During Test)

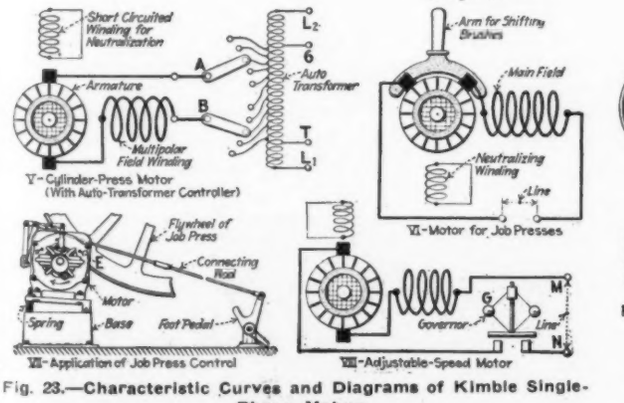


Fig. 23.—Characteristic Curves and Diagrams of Kimble Single-Phase Motors.

In diagram V is shown the method of control used by the Kimble Company for its cylinder-printing-press motors. By using two control handles and an autotransformer, 30 overlapping speed steps are obtained. The handles, as shown, are in the position of maximum speed, impressing 110 volts on the motor. By utilizing the autotransformer control, the same outfit can be used either on 110 or 220-volt circuits. This motor (and also that shown in VIII) use a fixed brush setting. The motor of V and also that of VI can be used only on constant-torque loads.

In VI is shown the ideal diagram for the job-printing-press motors, while in VII is illustrated the method of their application. Speed control is obtained by shifting the brushes. In VIII the adjustable-speed motor is shown. The speed is maintained constant at any given speed within the range of the motor by the action of the centrifugal governor G, which opens and closes the main circuit. All Kimble motors are of the compensated series type and employ a neutralizing winding.

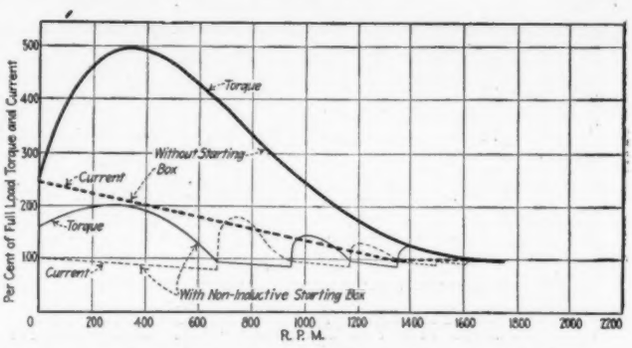


Fig 24.—Typical Starting-Torque and Starting-Current Graphs for Repulsion-Starting-Induction-Running Motors. (Century Electric Company).

Motors of standard construction and rating will be found capable, when the voltage and frequency for which they are wound and adjusted is maintained, of bringing up to speed a load equal to at least 1½ times their rated capacity. When connected directly across the line (as is the most customary type of installation) they have torque and current curves similar to those shown in the upper part of the diagram. When using a resistance starter the torque and current curves are reduced to the type shown by light lines in the lower part.

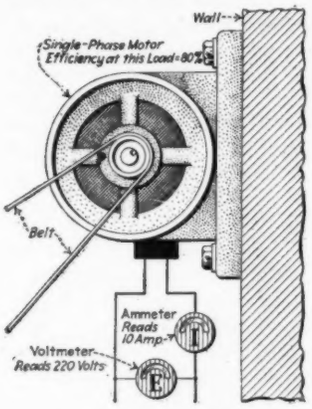


Fig. 25.—Example in Computing Horsepower Output of a Single-Phase Motor.

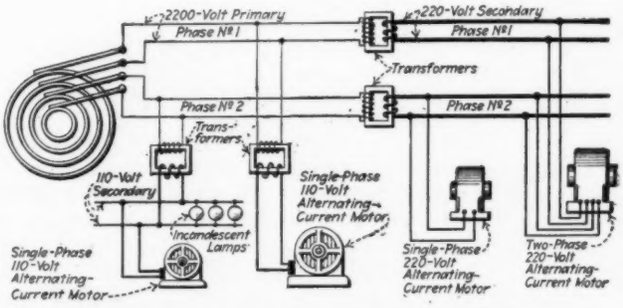


Fig. 26.—Diagram of Methods of Supplying Motors from a Two-Phase line.

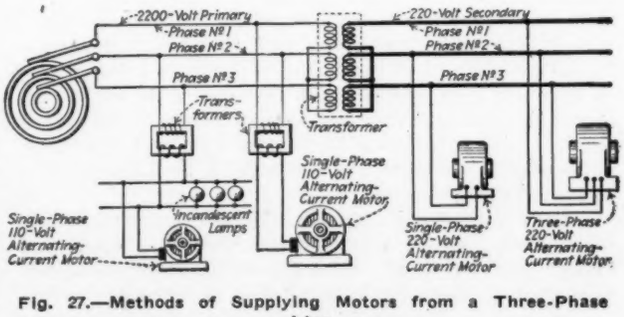


Fig. 27.—Methods of Supplying Motors from a Three-Phase Line.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

COMPREHENSIVE APPLIANCE CAMPAIGN FOR LOUISVILLE.

Although Louisville Gas & Electric Company Does Not Sell Appliances Its Entire Force Will Be Directed to Increasing Use of Devices.

The house-wiring campaign which the Louisville Gas & Electric Company has been conducting since January 1, 1914, will come to an end on June 1. During these three and a half years something more than 13,000 already built residences in the city have been wired. It is believed by the management of the company that the extensive advertising which has been done on the subject and the agitation have convinced the householder of the desirability of having his house wired for electricity. In other words a man who owns a house now wants electric lights in it just as much as he wants a tight roof over it. Further solicitation will be left to the electrical contractors.

The first of June will see the Louisville Gas & Electric Company institute a new campaign, designed to increase consumption of current by selling to persons now patrons of the company electrical appliances of all kinds. This campaign will be conducted in connection with the recently announced proposal of the company to sell excess current at a net rate of three cents, that being the talking point on which to approach the consumer. Robert Montgomery, manager of the commercial department of the company, observed in discussing the plans of the campaign, that experience has shown that it is practically essential a talking point be provided.

Details of the campaign are still to be decided upon. It provides, however, for an intensive canvass of perhaps 10,000 of the residence customers of the company, customers able to indulge their fancy in purchase of appliances and customers who normally consume the six kilowatt-hours per month per room to justify them in contracting on the new basis. This, as previously noted in these columns, requires the consumer to sign a contract guaranteeing a consumption of three kilowatt-hours per room per month and gives him the excess over six kilowatt-hours at the rate of three cents, net.

Divide City into Districts.

The same organization which has been promoting the house-wiring campaign of the company will carry on the campaign that is to start on June 1. This begins with the city divided into six districts, each in charge of a salesman. These salesmen will work on a flat salary, plus commissions. Each will be provided with a display book containing the canvas-backed photographs of the appliances on the market, carrier in loose-leaf form, and each will take orders for any of the appliances any customer wishes. Orders will be written in triplicate. One copy will go to the customer, one will be retained by the electric company and one will be turned over to a local dealer in appliances.

The orders will be apportioned by the commercial department of the Louisville Gas & Electric Company, in the same manner as the contracts for house wiring have been apportioned, the division being made as equal as circumstances permit. Suppose a particular iron is ordered by the customer: the order will naturally have to go to a dealer handling that make of iron. If an order is for an item handley by several, the division will be in rotation, etc. Once the order is taken from the customer, however, the electric company, turning it over to a responsible dealer, is through with it. The dealer makes the delivery on the order, makes a 30-day charge; collects cash or takes the order and the rest of the transaction is between him and the purchaser. In cases of easy payments, which the salesmen are authorized to offer to any of the customers, the details of the contract are arranged between the dealer and the customers and the Louisville Gas & Electric Company will not be obliged to trouble with the collections and the bookkeeping in this connection.

The matter of commissions will be arranged on an interesting basis—the exact allowances to be offered having still to be determined. The electric company will pay the commission where the sale is of an item that in all probability will mean a considerable increase in the consumption of electricity in the home of the customer. Where, however, the appliance does not involve the probable use of more current or much current, the dealer will pay the commission. In all cases, however, the central-station company will pay the salesman regularly as he turns in the orders and look to the dealer to reimburse it on the commissions on appliance sales advanced to the salesman.

Louisville Company Does Not Sell Appliances.

An unusual feature of this campaign is that the Louisville Gas & Electric Company does not handle any appliances whatever. Its only opportunity to profit will be through the increased consumption of current. For that reason the commission allowance will be based on that view of the case. On washing machines and heating pads, used infrequently and likely not to mean much of an increase in the energy receipts, commissions will be paid by the dealers. Percolators, used two times a day in the average home, electric fans, electric irons and other items—including electric ranges—will pay a commission put up by the gas and electric company, based on the average estimated increased consumption of electricity in the houses to which they go.

This campaign will be conducted among the customers of the company who are likely to be attracted by the offer of reduced prices on excess consumption. The meter readers of the company as they made their rounds have been collecting data as to the number of rooms in the residences on the company's lines. This information is being compared with the collections from these houses, showing those which invariably use up to the minimum of three kilowatt-hours per month per room. The result will be about 10,000 or perhaps 15,000 addresses of customers who need only to have it shown to them that they cannot lose by the proposition before they sign the contract. Of course before they are approached on this basis, the list of those who have already contracted will be checked against the prospects.

Advertising Features of Campaign.

The plan is to circularize the logical prospects. Each will receive a high class circular letter, individually addressed and containing the statement that the householder addressed will

find it to his advantage to sign the contract that is inclosed with the letter. It will be explained that the person addresed has nothing to lose and at the same time has an opportunity to make more extended use of electrical devices by being able to take advantage of the three-cent excess rate. Inclosed, also, will be an attractive booklet, further amplifying the proposition with definite allusions to the types of the appliances and giving elaborate details as to the cost, reduced to terms of cents—how many cups of coffee one cent's worth of three-cent electricity would make, etc.—so as not to cloud the issue with technical discussions of wattage, kilowatts, etc.

These circulars will be sent out in installments, keeping just ahead of the salesmen. They will be routed according to the streets and districts, not alphabetically. On the day or the second day after the customers on one street have been circularized, for instance, the salesman would follow, ascertaining whether the contract on the three-cent proposition had been sent in. If not it would be his business to explain by word of mouth that the plan is to the customer's advantage and to obtain the signature, if possible. Then the way of the salesman is cleared for solicitation of orders for the numerous appliances which are on the market.

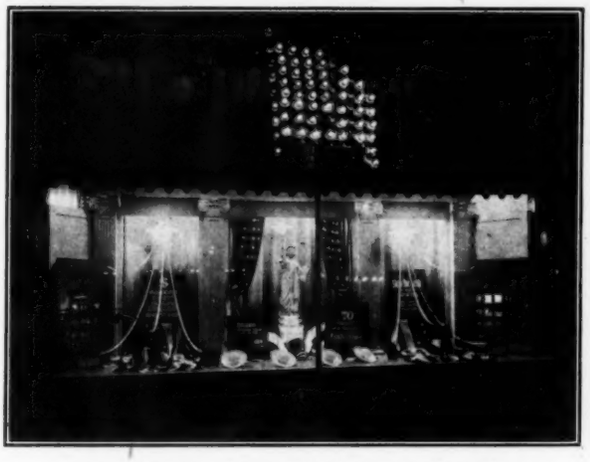
No restrictions on sales will be placed by the company. Percolators, selling for less than $10, for instance, and worth about $4 a year in increased revenue to the company at the three-cent rate for current may be pushed as hard as the salesman will, the fact that they are more readily sold than more expensive items being all the same to the company, which wants to see the largest possible number placed. The company's interest in a washing machine, which might not consume more than 6 or 8 cents worth of three-cent current a month, is not very great, although the salesman's interest would be sufficiently so to make him keen to sell them.

Special attention will be paid to the consumer on the country lines of the company. The service is supplied to country residents in a radius of 18 or 20 miles from the city. Coal is always expensive delivered to country homes and at the present and prospective prices, the advantages of electric ranges will be very apparent, while the wealthy man with his elaborate country home should be able to buy an electric range without difficulty when it came to financing the deal. The same proposition will be extended to the automatic refrigerating equipments, while the farm customers will have the opportunity to buy all manner of electrical equipment which the salesman will bring to their attention.

Lighting Campaign in Toledo Meeting with Success.

Back of the successful selling campaign is the unique and attractively arranged display window. Proof of this state-

Window of Toledo Company Which Shows Effect of Proper Lighting.



Lamp Window Display Used During Campaign.

ment was given by A. K. Young, manager of the new-business department of the Toledo (O.) Railways & Light Company, when he reviewed the work of the past two weeks, of a selected corps of illumination experts, who have been advancing the merits of the new "four-in-one" fixture among the manufacturers and store-keepers of Toledo. As a result, many of the business places in the down-town section now have more efficient and better lighted display windows than ever before. As the accompanying photographs show, the new type of fixture is used to good advantage and brings out with startling clearness the objects used in the arrangement of the company's own display windows, featuring the "four-in-one" fixture. In one display a number of small stone Chinese street lamps were used with good effect to show the wide difference between ancient and modern lighting. In all the displays, educational cards, placed conspicuously and with streamers attached to the fixtures above, gave interesting information on the merits of a well lighted shop or factory, and pointed out where much money was wasted and many persons injured yearly, due to poorly lighted work rooms.

The company's patriotic display, with the Statue of Liberty and the photograph of the President at the base, was unanimously acclaimed the most attractive and best executed patriotic display in the city by local merchants.

Easton Company Secures 24-Hour Paper-Mill Load of 3500 Horsepower.

A 10-year contract has been closed by the Pennsylvania Utilities Company, Easton, Pa., with the Warren Manufacturing Company for the power requirements of the four paper mills of this company at Milford, Warren, Hughesville and Riegelsville, N. J., and the electrification will aggregate about 3500 horsepower in motors. The Warren Manufacturing Company manufacture jute and manila paper as well as a high grade glassine paper and the mills are located south of Easton on the New Jersey side of the Delaware River about 10 miles below Phillipsburg.

To serve this consumer a double-circuit 33,000-volt line will be built from Easton, which will pass through a territory containing several large manufacturing plants at present not using central-station service and which aggregate 20,000 horsepower in their own power-plant capacity.

Service will be given the Warren and Hughesville mills for part of the load about July 15 and the balance, including Milford, which is the largest of the mills, will be served as soon as equipment can be obtained. The date of electrification at Riegelsville, the smallest of the mills, has not been decided upon. The paper mills operate 24 hours a day and it is expected that the annual energy consumption will be 8,000,000 kilowatt-hours.

New-Business Department of Commonwealth Edison Company Secures Large Contracts.

An indication of the increasing popularity of central-station service is given in reports of recent contracts for power and light secured by the Commonwealth Edison Company, of Chicago. Among them are the following contracts: Regan Printing Company, new building in Plymouth Court, 700 horsepower and 1200 lamps; H. O. Shepard & Company, printers, Sherman Street, 900 50-watt lamps and 220 horsepower, displacing an isolated plant; Interstate Iron & Steel Company, East Chicago, 1000 50-watt lamps and 2330 horsepower; A. C. Dallas & Son, 215-kilowatt heat-treating furnace; the Crilly Building, 2000 50-watt lamps; new building for John Sexton & Company, grocers, 2500 lamps and 400 horsepower.

New Power Plant at Binghamton Nearing Completion.—The final stage of installation of apparatus for the first two generator units of the Binghamton (N. Y.) Light, Heat & Power Company has been reached in the construction of this plant, and it is expected that within the next three weeks the 3500-kilowatt unit with two boilers and the necessary auxiliaries will be ready to turn over. Plans for immediate extension to install the third unit are under way and preparation being made for beginning the necessary excavations for foundations. The coal bunker is completed; the coal-handling machinery will be installed the coming week, and in general all apparatus and auxiliaries necessary to operation will be in place at the time set for starting the turbine.

Discontinue Lighting of Boston State House Dome as Military Precaution.—The dome of the State House, Boston, Mass., which since 1898 has been illuminated with about 500 incandescent lamps, will until the end of the war be unlighted, owing to military precautionary measures.

RECORDS FOR THE CENTRAL-STATION'S NEW-BUSINESS DEPARTMENT.

Adequate Forms Aid in the Work of Keeping "Tabs" on Progress of the Department.

The value of records is most appreciated when they are lacking, for then the need of them is most apparent. Records are necessary if a definite retrospect of previous business or work is wished, and they assist materially in gauging activities. Of course, there are limitations in the keeping of records. One may go too far in his zeal to record the activities of a business or the work of an individual, resulting in complicated forms and statements that are difficult to maintain and whose real value is questionable. There is a medium, however, found by good judgment, which results in presenting records of concise and ample characteristics which are invaluable to any business enterprise.

Each department of a central-station company keeps statistics on its performances, and while the new-business department is perhaps no more important than any other department, its records have a significance that attaches to no other. This is because the statistics on new business are generally looked upon as indicative of the progress of the company. It is for this reason so much importance is attached to them.

Forms are a great aid in the systematizing the work of keeping records. While no single set of forms is applicable to every new-business department, the principles involved may be used to good advantage. The set of forms illustrated has been prepared by the Indiana & Michigan Electric Company in its new-business department which is under the direction of M. S. Caldwell. The forms have been developed and revised to their present state and have proved worthy of recommendation to other new-business departments.

Fig. 1 is a daily report form. Spaces at the top portion

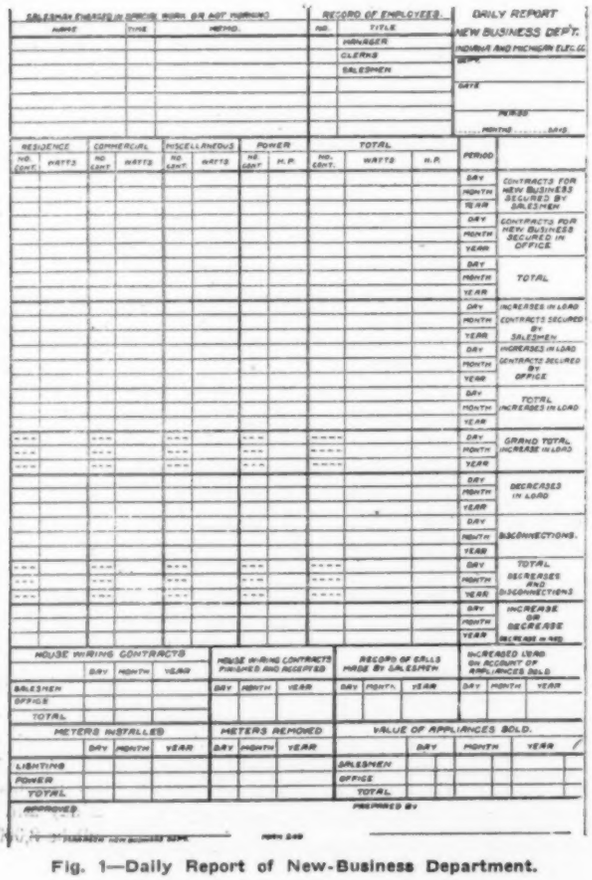


Fig. 1—Daily Report of New-Business Department.

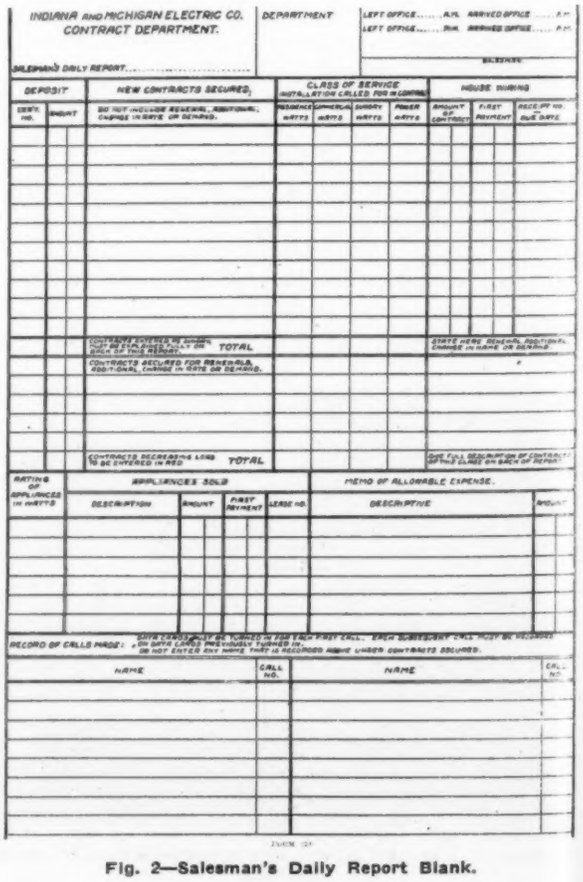


Fig. 2—Salesman's Daily Report Blank.

provide for a list of those employed in actual work of the department or engaged in other duties. Below this are spaces for recording the total number of contracts secured by sales-

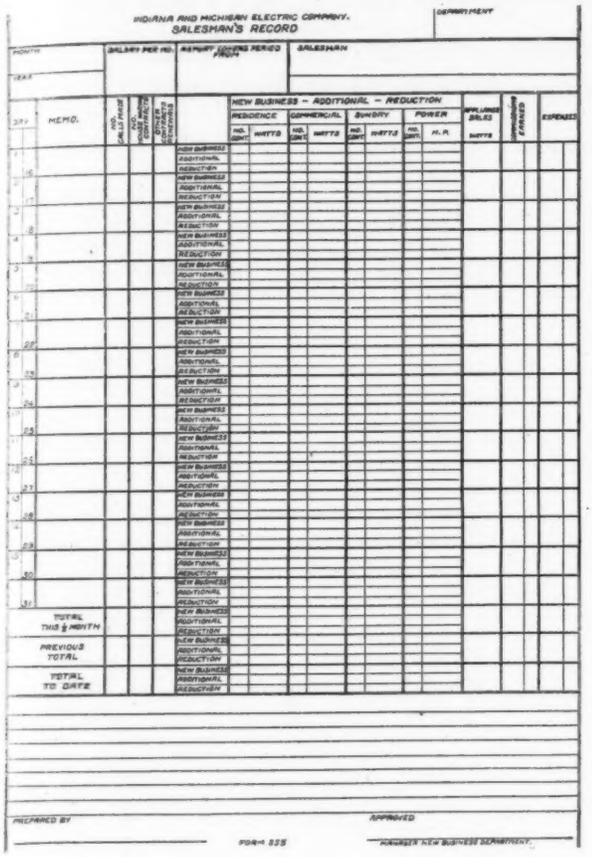

INDIANA AND MICHIGAN ELECTRIC COMPANY.
SALESMAN'S RECORD
DEPARTMENT
MONTH
SALARY PER MO.
REPORT COVERING PERIOD FROM
SALESMAN
NEW BUSINESS — ADDITIONAL — REDUCTION
RESIDENCE
COMMERCIAL
SUNDRY
POWER
APPLIANCE SALES
STANDARD CHARGE
EXPENSES
DAY
MEMO.
NO. CALLS PAID
NO. CALLS MADE ON PROSPECTIVE CUSTOMERS
NO. CONTRACTS SECURED
NO. CONT.
WATTS
H. P.
TOTAL THIS MONTH
PREVIOUS TOTAL
TOTAL TO DATE
PREPARED BY
APPROVED
FORM 555
MANAGER NEW BUSINESS DEPARTMENT

Fig. 3—Form for Recording Individual Work of Salesmen.

men or in the office for the day, month and year. By means of columns these contracts are listed under residence, commercial or miscellaneous, depending on their character. Increases and decreases in load and disconnections are also recorded, as well as house-wiring contracts, salesmen's calls, meters installed and removed, appliances sold and increased load due to appliances. As a whole, this form, when filled out, constitutes a ready reference of the new business secured for the day, the month and the year, and forms a composite record of the activities of the department.

Fig. 2 is a salesman's daily report and is self-explanatory. From these daily reports the data, added to that taken from the previous day's report, are secured for making out the daily report of the department.

Fig. 3 is a form kept in the office for recording the work and the salaries, commissions and expenses of the salesmen, and is a comprehensive record for each salesman's work.

When the forms were first tried out, it was found to be a considerable task to fill them out properly but now that they have been in use for some time it has become possible for the clerk handling that work to make out the daily department report and enter the data for keeping the records of six salesmen in less than half an hour.

Besides serving as a medium for recording the work of a new-business department, forms such as those shown are valuable for stimulating interest in the progress of the department because they give this information at a glance. The shortcomings of the sales force are shown up more quickly and noticeably, affording greater opportunity for their correction.

Electric Water Heaters Increasing in Boston Edison Territory.

With proper installation and careful use, the electrical water heater is found to be an efficient and convenient unit for the household, where a fairly low energy rate is possible. In Boston Edison territory there is a considerable number of these heaters. For a family of four people, it is found that the total monthly bill, on the two-cent secondary rate, will run about $5.00 per month. Assuming 32 baths per month, with 18 gallons of water each, at 120 degrees, the cost would be about $1.92 for this bathroom service, while for clothes-washing purposes, four or five washings monthly, with 50 gallons of water at 150 degrees, would involve the use of about $1.12 worth of energy monthly.

For kitchen use, if the electric heater is turned on 30 minutes before each meal, five or six gallons of water will be ready for use for dish-washing, the cost being about three cents for each meal. This amounts to about $2.70 per month.

Heaters installed at Boston are equipped with the three-heat switch, for full, medium and low heats. The electric heater can be used as an auxiliary to the coal fire in winter, and can be used entirely in summer, or all the year. The Edison company does not recommend the instantaneous type of heater, on account of the comparatively large amount of current consumed, if arranged to supply the amount of water used in ordinary households.

It is pointed out that where hot water is to be used continuously, the boiler being always hot, it is advantageous to have the boiler covered with asbestos or magnesia. This reduces loss of heat 60 to 70 per cent.

Wisconsin Company Plans Extensive Transmission Line.

The Wisconsin-Minnesota Light & Power Company will build 90 miles of transmission line out of La Crosse, Wis., this year connecting with Sparta and Tomah and with the present terminus of the Wissota power plant at Nelson, Wis., according to an announcement by Vice-President A. E. Peirce, of Eau Claire.

The company originally planned to continue its transmission line, now leading from the Wissota dam to Nelson and Wabasha, as far as La Crosse this year. The plan has been extended by the recent purchase of the electric lighting and power companies at Sparta and Tomah. The utility now finds it necessary, in order to handle an increased business in sight at Sparta, to connect the plant at that place with the big station in La Crosse. Plants at Sparta and La Crosse will furnish light and power at Tomah over a transmission line to be erected between Sparta and Tomah.

"Construction of the transmission line from La Crosse to Sparta and Tomah, and from Nelson to La Crosse, must be put through this summer," says Mr. Peirce. "I am planning to order lines and poles and other equipment at once. The lines will cost $3,500 per mile."

Mr. Peirce further declared that the Wisconsin-Minnesota Light & Power Company would this year finish the second unit of the Wissota dam, increasing the capacity of the big plant above Chippewa Falls from 22,000 to 45,000 horsepower, the maximum load planned for the plant. He said the company has business in sight, principally in St. Paul, to use practically all of this power.

Public Service Police for Pennsylvania.—The Pennsylvania State Legislature is considering a bill, introduced by Representative Spangler, providing for the appointment of special policemen by the Governor for electric, gas, water, telephone, telegraph and other public utilities on the petition of the particular company. The men are to be known as "public service police" and are to be paid by the utility companies.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

IMPORTANT INSTALLATION OF FIRE ALARMS IN NEW YORK CITY'S CHARITABLE INSTITUTIONS.

A Complete Fire-Alarm System With Many Interesting Features Installed in Several Groups of Nonfireproof Buildings.

The City of New York has under its care several thousand helpless wards of all ages who are cared for in groups of municipal charitable institutions located principally on several islands in the East River and under the care of the city's Department of Public Charities. Most of the buildings housing these institutions are quite old structures, having been built before modern ideas of fireproofing came into vogue. Housing, as they do, some 17,000 or more helpless inmates, these buildings constituted a most serious life hazard in case of possible fire. A fatally disastrous fire in New York City a few years ago directed attention to the possibility of similar disasters in the city's own institutions and it was therefore decided to do what was possible to minimize the dangers by the most practical means available.

The charity authorities undertook a study of the problem, which was later turned over to the consulting engineering firm of Porter & Himmelwright. Included in these various hospitals, homes, sanitariums, etc., are a total of 206 buildings, of which 159 are institutional and 47 are service buildings, the latter including boiler houses, laundries, workshops, storehouses, kitchens, garages, stables, etc. This gives some idea of the magnitude of the problem.

Probably the chief recommendation made for its solution was the sectionalizing of the larger buildings by means of fire walls in which a few special doors were left to serve as "horizontal fire exits," that is, means for readily leaving a burning section by passing to another section on the same floor without climbing any stairs. This resulted in division of the fire hazard. Every possible source of hazard was investigated in the report and suggestions made for its elimination, all of which were carried out.

General Features of Fire-Alarm System.

Included in the report was a complete design for a fire-alarm system for all of the buildings in each group, the system being specially adapted to the particular requirements imposed by the helpless character of most of the invalid, feeble and aged inmates. It was required to signal only those occupants who were in the immediate danger zone and not disturb those in sections of the building not involved. This was not only to prevent needless alarm among the patients, but also to make the work of the attendants most effective. The system was, of course, required to call the fire department to the place of the fire and also to notify the central office.

Formerly a rather crude system of alarms was in use. It was necessary to telephone from the building on fire to the boiler room from which it was heated. The boiler attendant then blew a large steam whistle according to a signal code that indicated which building was afire. This system was entirely unsatisfactory. It involved much possible delay through inability to reach promptly the man in charge of the boiler plant. It also was liable to complete failure and in any case caused serious alarm to all of the inmates of the institution, even those not in the danger zone, many of whom were rendered more seriously ill due to the excitement.

Operation of the System.

The wiring of the fire alarms in each building section or "fire unit" was entirely independent of all other fire units, being connected to the main office of the group of buildings of which it formed a part. When any signal box is operated it causes a signal to be indicated visually and audibly and repeated at least four times on every floor of the unit. Suppose a fire occurred on the third floor in unit (or section) 4 of a particular hospital group. The signal used would flash and ring 4-3, indicating unit 4 and floor 3. This is recorded in the office of the hospital on an automatic punch register and immediately transmitted automatically to what is called the "general fire-signal circuit." This is a common circuit connecting to all of the service buildings of the group, summoning all the attendants immediately to the source of the fire. A characteristic of all the signals in the institutional buildings is that they operate only in the unit involved so as to notify only the attendants of that unit and this in such a way as to alarm and excite the inmates as little as possible. The signal bells make little objectionable noise but still attract immediate attention.

The signal boxes are wired in series on a closed circuit, so arranged that on grounding or opening of the circuit there is shown a distinctive signal at the central office operated from a separate source of current and instantly showing the circuit in trouble. The central office is also connected to the city fire department headquarters. The visual and audible signals consist of a 10 or 20-watt tungsten red lamp and a tapper.

This system has operated perfectly since it was installed.

Trouble on Overhead Lines Caused by Squirrels.

The Interstate Light & Power Company, of Galena, Ill., at an expense of more than $1 a pole, is equipping its 1,500 poles between Platteville and Galena with galvanized-iron squirrel guards. These guards resemble an inverted dishpan with the bottom removed to make room for the pole.

In the past the company has suffered much inconvenience from squirrels running up poles when frightened, and touching the wires, which throws off all the power back to the Galena station. During the month of September they are most in evidence on the lines, and hundreds of the little animals are killed annually by the wires.

The telephone companies also have their troubles with squirrels, but in another direction. In cities having lead telephone cables, such as are being put up by the Farmers' Telephone Company in Platteville, the squirrels often gnaw a hole through the lead sheath to get at the insulation inside. Water gets into the opening and short circuits the wires, causing trouble to the service. Madison, Wis., has had much of this trouble in the last two years, and a movement is under contemplation to drive the squirrels from the city.

The Slotting of Commutators

How Commutator Slotting Promotes Economical and Reliable Operation—Special Machines and Tools Used in Undercutting the Mica and Details of How the Work Should Be Done

By E. H. MARTINDALE

Chairman, Industrial and Domestic Power Committee, A. I. E. E.

This is the fifth of a series of 14 articles dealing with the solution of commutator and brush troubles. The series began in the issue of March 24 and appears at intervals of two weeks. In the earlier articles the characteristics of carbon brushes were discussed and an outline given of brush troubles. The present article shows the importance of commutator slotting. Other aspects of commutation troubles will be taken up in the remaining articles.

COMMUTATOR SLOTTING, also called grooving or undercutting, consists in removing the mica from between the commutator segments to a slight depth, generally about 1/32 or 3/64 inch below the surface of the commutator. This leaves only the copper in contact with the brushes.

This practice, tried in isolated cases twenty or more years ago, did not come into general favor until about 1905, when its economy for railway motors was definitely established. Within a few years about ninety per cent of the railway-motor commutators were undercut. It is surprising that the practice did not spread immediately to industrial motors and generators, but for eight or ten years only a slow development took place, except in a few industries, such as the steel industry. During the past two or three years commutator slotting has been gaining favor in the industrial field almost as rapidly as it did years ago in the railway field.

Economy and Other Advantages of Commutator Slotting.

On undercut commutators brushes with very low friction and without any abrasive action can be used, while on flush mica brushes with sufficient abrasive action to prevent the mica from becoming high must be used. This not only means commutator wear but, as it is impossible to get abrasive action without relatively high friction, it also means greater heating of the commutator and a corresponding power loss. As pointed out in the third article of this series, published April 21, 1917, the annual power loss with a high-friction brush is a very serious matter. It was shown that the use of a brush with a coefficient of friction of 0.7 operating at a pressure of 2 pounds per square inch cross section on a 100-kilowatt, 220-volt generator with a power cost of one cent per kilowatt-hour meant an annual friction loss of $99.30. An extreme case was also taken in which the annual friction loss on a 100-kilowatt, 110-volt generator with a power cost of two cents per kilowatt-hour reached 19 per cent of the generator capacity or $1,140. Seventy per cent of this loss can be saved by undercutting the mica, which will permit the use of a low-friction nonabrasive brush.

Other advantages of undercutting are increased life of commutator and brushes, elimination of flat spots, flashovers, sparking, glowing of brushes and burning of commutator, and decreased heating, which permits an increase in the load on the machine. It must be remembered that commutation and commutator heating usually limits the output of a commutator machine more than does the heating of its windings.

When Commutator Slots Should be Painted.

As a general proposition it may be said that all motors and generators will operate better with slotted than with unslotted commutators when proper brushes are used. Where machines are operating in a very dirty location, or where oil creeps onto the commutator from the bearings, or where the voltage between bars is so high that short circuits are liable to occur, the slots should be filled with commutator cement or painted with a clear air-drying insulating varnish.

Painting the commutator slots is inexpensive and is probably good practice on any machines which cannot be given frequent attention. A varnish should be used which will not gum a commutator stone used to clean off the surface of the commutator bars after the varnish has hardened.

Machines for Slotting Commutators.

There are a number of slotting machines on the market and many home-made devices. Most of the standard slotting machines use for the cutting tool a circular milling saw ¾ to 1¼ inches in diameter with from 15 to 30 teeth. The thickness of the saw should be about 0.005 inch greater than the thickness of the mica, which will completely remove it.

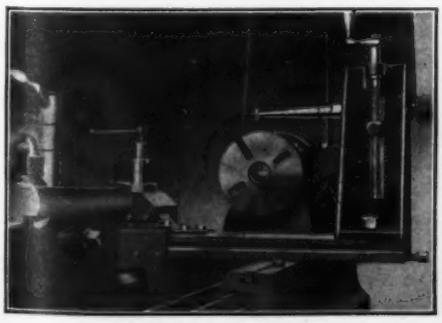


Fig. 1—Lathe-type Commutator-Slotting Machine.

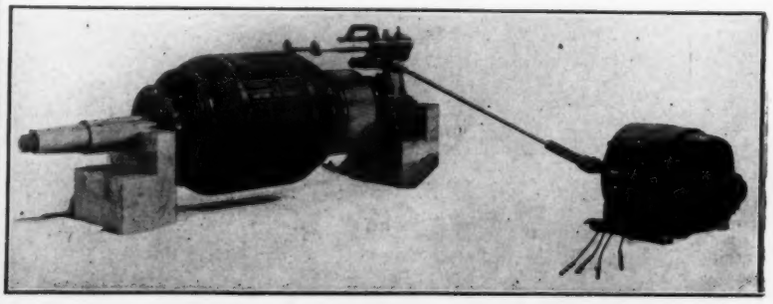


Fig. 2.—Portable Commutator-Slotting Machine.

Otherwise thin strips of mica may be left along the edges of the slot, which are sure to cause poor operation.

There is a device manufactured by Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., which can be mounted on the tool carriage of a lathe. The saw is driven at from 1200 to 1800 revolutions per minute by a belt from the lineshaft or by a small motor mounted on the carriage. With a spacer the same width as the commutator bars two saws may be used on commutators over eight inches in diameter.

Fig. 1 shows another slotting machine which can be mounted on a lathe. This device is manufactured by the Charles N. Wood Company, 789 Milk Street, Boston, Mass. The rigid arbor which carries the saw is adjustable up and down by the hand screw shown. The whole attachment can be moved by the tool carriage to and from the operator as well as lengthwise of the work which is carried on the lathe centers.

Fig. 3—Portable Commutator Slotter.

Fig. 4.—Pedestal-type Portable Slotter.

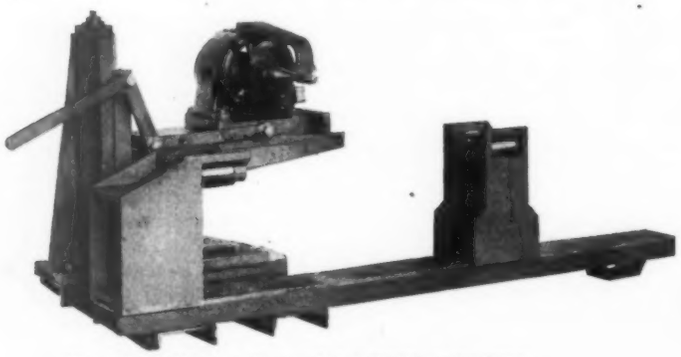


Fig. 5.—Stationary Commutator-Slotting Machine.

Fig. 6.—Burke Commutator-Slotting Tool.

Fig. 7.—Slotting a Commutator with the Burke Tool.

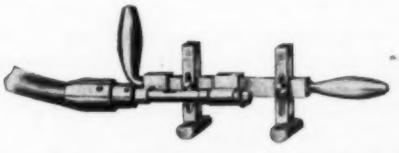


Fig. 8.—Westinghouse Hand Commutator Slotter.

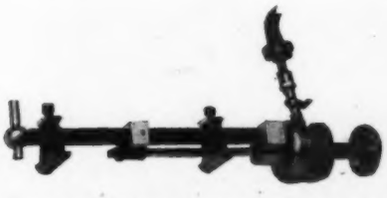


Fig. 9.—Another Westinghouse Slotter.

Fig. 2 shows a portable commutator slotter, manufactured by General Electric Company, in which the slotting tool is clamped onto the armature shaft while the work is being done. The driving shaft is equipped with universal toggle joints and provision is made for either belt or motor drive. For independent drive the motor supplied is rated at one-

eighth horsepower, operating at 1200 revolutions per minute, on direct current, and at 1800 revolutions per minute on alternating current.

Fig. 3 shows a portable outfit sold by the Electric Service & Supplies Company, Philadelphia, Pa. This can be adjusted for armatures of varying length and diameter, beginning with small air-compressor motors. When operated independently a one-eighth horsepower motor is required to drive it, but when operated as a stationary tool it may be belted to a counter or lineshaft. The weight of the machine proper is 148 pounds, the weight of the rear support is 35 pounds. In

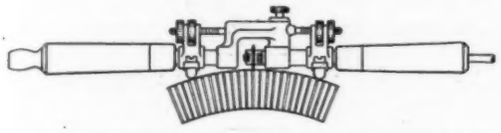


Fig. 10.—Swiss Commutator-Slotting Device.

addition the company makes a type which can be attached to a lathe.

Fig. 4 shows another portable type manufactured by General Electric Company for commutators from 4 to 8 feet diameter.

Fig. 5 shows a stationary slotter manufactured by General Electric Company equipped with a one-eighth horsepower motor operating at 1200 revolutions per minute on either direct or alternating current. The base is provided with adjustable pillow blocks having V-shaped bearing surfaces with brass rollers. The sliding arm is designed for both vertical and angular adjustment, the latter adjustment to be used when the commutator bars are not exactly parallel to the shaft.

Figs. 6 and 7 show two views of a hand device known as the "Burke commutator-slotting tool" manufactured by the Railway & Industrial Engineering Company, Pittsburgh, Pa.

Figs. 8 and 9 show two hand devices manufactured by Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The device in Fig. 8 is operated by a one-fourth

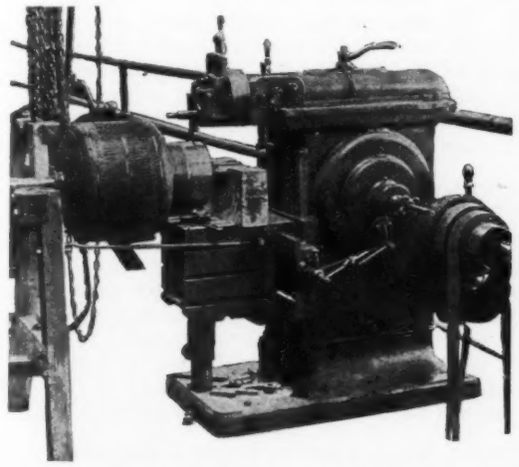


Fig. 11.—Shaper Equipped with Slotting Tool.

horsepower motor running at approximately 1700 revolutions per minute. A five-foot flexible shaft is provided for connecting the tool to the motor. The device in Fig. 9 is pneumatically operated by an air turbine at a pressure of from 40 to 80 pounds per square inch.

Fig. 10 shows a hand device manufactured by Maschinen-Fabrik Oerlikon, near Zurich, Switzerland. The cutter is operated at a speed of 500 to 700 revolutions per minute, by a one-eighth horsepower motor through a telescopic shaft fitted at each end with a universal link. The motor is attached to the handle on the right-hand side of the machine, while the handle on the left-hand side is hollow and can be connected to a vacuum cleaner or condenser for drawing the dust and dirt away from the work.

All of the above machines use the circular milling saws.

A home-made method in frequent use consists in grinding a lathe tool to fit the slot. This tool can be mounted in the tool post and moved back and forth across the commutator by operating the carriage or it may be mounted on a special post and moved back and forth by a hand lever. Fig. 11 shows a shaper equipped with a special tool.

Many operating companies and individual electricians use two or three-inch lengths of broken hacksaw blades fitted into a wooden holder.

Fig. 12 shows a commutator-slotting file sold by Handy Supply Company, 11737 Detroit Avenue, Cleveland, O. This tool does very rapid and efficient work and is without doubt the best hand tool on the market. The work can be done without removing the armature from its bearings or without even removing any of the brush rigging except on very small machines. It leaves a smooth V-shaped slot in which dirt will not collect. Many of the large operating companies have discarded their expensive slotting equipments and adopted the use of this simple tool.

Finishing the Commutator After Undercutting.

After undercutting mica with any tool, except the commutator-slotting file, it is advisable to quickly go over each slot with this special file or a V-shaped sharp tool to remove

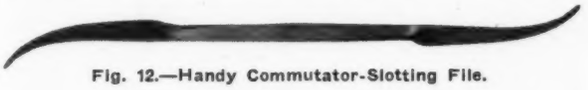


Fig. 12.—Handy Commutator-Slotting File.

any particles of mica which may have been left flush with the commutator bars, as such particles are almost sure to cause trouble.

Care should be taken not to get the slots too deep. A depth not to exceed 3/64 or 1/16 inch is recommended.

If there are flat spots or if the commutator is not true, it should be stoned, turned or ground before the mica is undercut.

With undercut commutators, brushes without any abrasive action should be used except where heavy sparking occurs. After undercutting, a regular commutator stone should be used for finishing the surface of the commutator as this removes all scratches left by tool marks or the slotting saws and permits the nonabrasive brushes to quickly polish the commutator.

If a commutator stone is not used, the scratches soon become black and give to the commutator a very poor polish until these scratches are worn out, which with nonabrasive brushes may be several months.

It should be borne in mind that a nonabrasive brush does not mean a soft brush, as some of the hardest brushes manufactured have no abrasive action and will not wear a commutator as much as soft graphite brushes.

Bonus to Employees.

The Schimmel Electric Supply Company, 318 Market Street, Philadelphia, Pa., jobber of electrical supplies, has announced a bonus of 10 per cent to all employees, effective May 1, the commencement of the fiscal year of the company.

The Board of Fire and Police Commissioners, Paterson, N. J., has awarded a contract for the installation of a new fire-alarm telegraph system to the Watson Electric Company, 88 Ellison Street, that city.

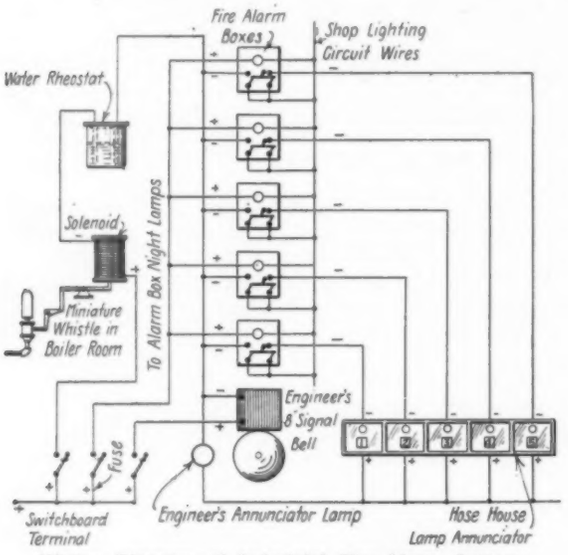
C. J. Elder, formerly connected with the Electric Supply Company, Salt Lake City, Utah, has opened a fixture and appliance store at 2430 Hudson Avenue, Ogden, Utah.

Fire-Alarm System for Large Railway Shop.

By J. O. Burris.

Safety in any large industrial plant requires that it have a private fire-alarm system to summon instantly the private fire department and also, in case of a serious fire, to call the nearest city fire department. A few years ago it was put up to me to install a fire-alarm system in a large railway shop in Ohio and it was insisted that it be simple and reliable. Now that the system has throughout five years proven entirely dependable, easy to maintain, and never failed to give service it may be of interest to plant electricians to describe it.

This system has been called the "safety first" system because of its reliability and simplicity. It employs no batteries, but is tapped on the lighting circuit, which has never failed. The positive wire is connected to the power-house switchboard and the alarm boxes are connected to the negative side of the nearest lighting circuits, thus completing a simple circuit. Each alarm box is provided with a red lamp that is lighted at night and serves to show the location of the box. In the box is a two-pole knife switch, the closing of which performs three functions. It rings an eight-inch, 2000-ohm gong in the power house near the engineer's desk, it blows a whistle in the boiler room, and operates a lamp annunciator



Wiring Diagram of Industrial Fire-Alarm System.

in the hose house, showing the number of the alarm box from which the alarm was sent in. The fireman or engineer, whoever is nearest the shop whistle, gives on it a special fire signal whenever an alarm comes in. On hearing this signal all men in the plant who are appointed to act as firemen rush to the hose house, where they ascertain the location of the fire by noting the annunciator, and take out the fire-fighting equipment to the fire plug nearest to the fire.

It will be noted that three leads are taken from the positive line at the switchboard. Those making connection with the bell and whistle solenoid are closed at all times, while the third lead, which closes the circuit to the night lamps in the alarm boxes, is closed only at night. The solenoid and bell circuits are in parallel and are operated from the same pole of the two-pole switches in the alarm boxes, which are 10-ampere pony switches. The three switches in the power house are 30-ampere single-pole switches. The lighting circuits used are 220 volts direct current. A small water rheostat with carbon electrodes is placed in series with the solenoid. Near the engineer's bell is a lamp that is in series with the annunciator lamps and serves to indicate to the engineer that the latter lamps are all right. All the annunciator lamps and the engineer's lamp are 110 volts, while the alarm-box night lamps are 220 volts. A duplicate lamp annunciator is installed in the engine room of the power house near the eight-inch gong. This operates in parallel with the hose-house annunciator, but is not shown on the wiring diagram for the sake of simplicity.

This system has not only proven satisfactory to all concerned, but has been heartily approved by electrical and fire-insurance inspectors.

Among the Contractors.

Charles Eyman has opened a shop in Madera, Cal., and will handle supplies and do wiring.

E. T. Barron has sold his electric supply business in Roundup, Mont., to Gordon W. Ross.

The Hendry-Crossman Electric Company, Vancouver, B. C., has changed its name to the Crossman Electrical Machinery Company.

J. W. Lane has purchased the electrical business until recently conducted under the name of Sarsons & Lane, in Long Beach, Cal.

Meachan & Babcock, Seattle, Wash., have received the contract for the electrical work on the new $70,000 apartment building being erected in Seattle by P. D. Ehle.

The Arrow Electric Company, Seattle, Wash., was awarded the contract for electric wiring for power and light in the Northwest Dairy Company's building at 1620 Broadway, Seattle.

A. McDonald, who opened the first electric shop in Dillon, Mont., several years ago, and who has been located in Lewiston, Idaho, has returned to Dillon to assume the management of the Rife Electric Company in that city.

The Northern Electric Company, Duluth, Minn., at the present time is doing the electrical work on a $200,000 school building at Eveleth, Minn.; a $100,000 court house at Hibbing, Minn.; Bell telephone exchange, West Duluth; Carnegie library, West End, Duluth; Enger & Olson department store, Duluth, and a 600-foot ore-dock extension for the Northern Pacific Railway at Superior, Wis. In addition the company has contracts for considerable industrial work of smaller size.

A biographical sketch of M. A. Pixley, vice-president and general manager of the Erner & Hopkins Company, electrical jobber and contractor, 55 East Chestnut Street, Columbus, O., recently appeared in one of the Columbus daily newspapers. He has been connected with the concern since it was organized 18 years ago, starting as a wireman and advancing to manager. The company is making a specialty of industrial power installations, some of its important installations being those at the Hayes Wheel Company, Jackson, Mich.; the Louisville Cement Company and the Pioneer Pole & Shaft Company.

Herman Andrae Electrical Company, Milwaukee, Wis., is having a very busy contracting season and has a number of important contracts on hand at the present time. Among these are contracts for installing a 150-horsepower motor in the plant of the Luick Ice Cream Company, Milwaukee; wiring for light and power for the Merton (Wis.) Dairy Products Company, which is doubling the capacity of its plant; installation of service mains for the candy factory of the George Ziegler Company, Milwaukee; wiring, fixtures and appliances for residence of F. W. Foster, Brandon, Wis. The Andrae company recently completed the wiring of the steamer *Thomas Davidson* for the Crosby Transportation Company, and is now working on a contract for the wiring of the steamer *Livingstone* for the same company.

The Dealer and Storekeeper

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Appliances

Setting a Mark for Appliance Sales.

In a paper on "Electrical Merchandise—Its Sale and Upkeep," presented by E. C. Forest, of the Rockford (Ill.) Electric Company, at a recent meeting of the Committee on New Business Co-operation of the Illinois State Electric Association, he brought out an interesting point regarding sales compaigns on appliances. He said there was a very beneficial psychological effect produced on the sales force by having an exceptionally large stock of the device to be sold on hand at the beginning of a campaign. He illustrated by saying his company ordered 1000 electric flatirons at the outset of a campaign, and, though this number seemed large, there proved to be no great difficulty in disposing of them. The salesmen used this figure as a goal to be reached and extended their efforts in order to sell that many. All of the men in the company's whole organization were interested in the campaign and helped the salesmen by "boosting" the electric iron to their friends.

Stocking Up on Fans.

The experience of the dealers in electric fans last summer, especially in the north central section of the country where the demand was abnormally high during the three or four weeks' hot spell, will long be remembered in the electrical trade. It served as an illustration of the doctrine of "stocking up," though it was an extreme case and cannot be considered otherwise.

Besides the business lesson of keeping adequate stocks, another benefit of even greater value has resulted from the big "run" on fans last summer, which is that dealers in general have ceased to regard the fan as a strictly seasonable article from a merchandising viewpoint. The tendency now is to make efforts to spread the rates over a greater period rather than limit them to a period when hot weather will do the selling for the dealer. Of course, this plan calls for greater merchandising activity because prospective customers must be educated up to the various uses of the fan in periods other than the summer months, but that is purely a selling proposition and that is what the dealer is in business for. Emphasis on the necessity of preparing for the summer season is a sales argument that carries weight with the prospect.

A lot of sales activity in May and June helps the turnover on fans, and the dealer will be more prepared to handle the big rush when it comes.

Increasing Local Retail Business by Means of an Attractive Salesroom.

The William B. Duck Company, of Toledo, O., recently spent several thousands of dollars in the alteration of its place of business at 224-226 Superior Street. Special attention was given to the display of fixtures in the remodeled first-floor salesroom. The accompanying illustration shows the false ceiling which was installed to display to the best advantage the attractive fixtures which the concern handles. The other half of the salesroom is devoted to the Victrola department.

When the phonograph department was established easy installment payments were offered to local customers. Since these came in weekly to make their payments, it was found advantageous to make the first-floor salesroom more attractive and display the variety of electrical goods carried. Since the change was made the phonograph customers have also become liberal electrical customers.

Three years ago the company was devoting itself almost entirely to selling electrical appliances on a mail-order basis through the medium of a catalog, and little space was given to

General View in New Salesroom of Toledo Electrical Jobber and Retail Dealer.

the local retail trade. At this time three floors are used for the mail-order and jobbing departments and some idea of the extensive business of the company can be gained from the fact that recently an order for wireless equipment was received from the Danish Government for installation in Denmark.

Featuring Electrical Merchandise.

The Devere Electric Company, of Cincinnati, O., devotes considerable attention to the featuring of electrical appliances, and its window displays are decorated with a view of appealing to both the artistic and practical minded person. One of its most attractive displays had a background of white columns, twined with pink paper roses, while the space between the columns was hung with curtains of green silk. At one end was an ironing board, upon which were several electric irons with bright red handles; and at the other, several electric heaters, while on a little oak table was an electric chafing dish, percolator and toaster. Wall brackets enamelled in silver were in the shape of antique sconces, holding candles wired for electricity. A catchy card of good size called attention to the electric household helps:

SERVANTS

who are ready to work any hour of the day or night; never need sleep or rest; never complain; whose service costs you but a few cents each day—that, in effect, is what you get when you use Devere's

ELECTRIC HOUSEHOLD HELPS.

The Electric Shop for Automobile Work

Experience of Arthur Jones Electric Company Demonstrates There Is an Excellent Field for the Electrical Concern Selling Accessories and Making Repairs to the Electrical Equipment of Automobiles

By G. D. CRAIN, Jr.

ASK the average motorist what part of his equipment gives him the most trouble and the chances are that he will indicate the electrical features. This is not a reflection on the electrical equipment, but on the character of the service he is in the habit of getting.

That is to say, the typical general garage and automobile repair shop can handle motor and transmission troubles in fine style, but when it comes to locating and adjusting electrical troubles it is often found wanting. The result is that the motorist, unless he has been fortunate enough to put his electrical work into the hands of experts, is likely to be complaining all the time of his starter, battery or generator, when in fact all it needs is a comparatively slight adjustment.

Chicago Firm Handles Electric Auto Troubles.

"Hang Your Electrical Troubles on the Arthur Jones Electric Company" is a slogan which has been heard frequently in Chicago during the past eighteen months, a period in which the Jones concern has been forging to the front as electrical experts devoting themselves exclusively to the electrical equipment of automopiles. Arthur Jones, head of this concern, has been in the electrical machinery business for fourteen years, but at the beginning of 1916 he established an auto-electrical shop, and attention to this specialty has resulted in probably the most rapidly growing business of the kind to be found anywhere.

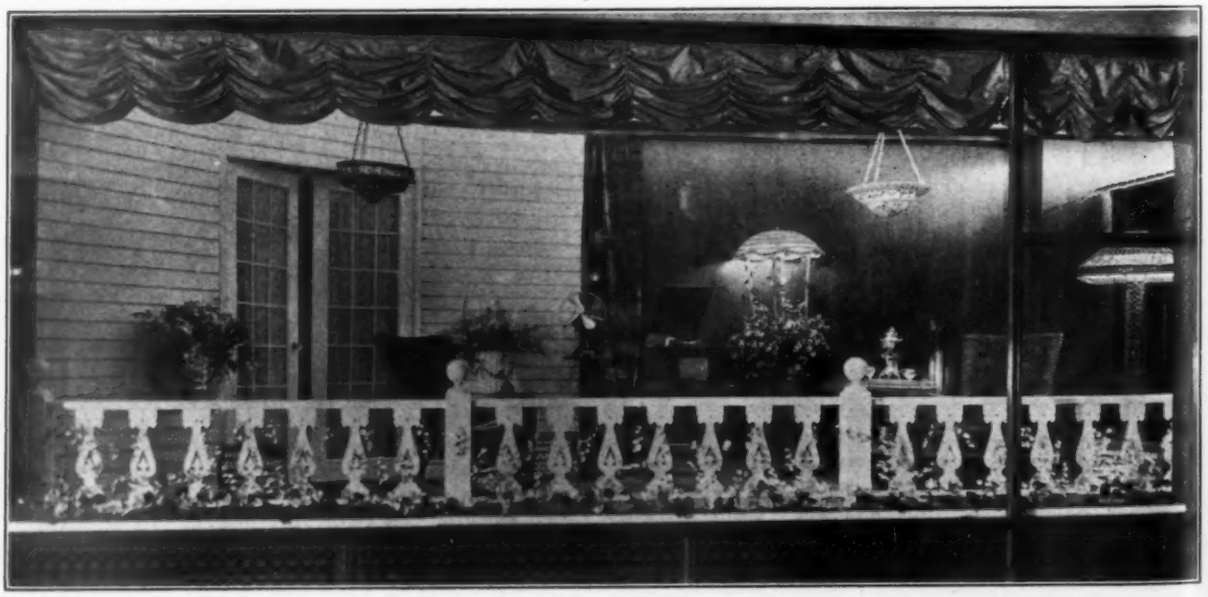
The address of the company is 55 East Twenty-eighth Street, just off Michigan Avenue, but the plant is distributed all over the block, additional space and equipment having been added as the needs of the business have grown. The demand for specialized service has become such that plans are now being made for a new plant, 60 by 125 feet in dimensions, laid out in the most approved manner and equipped for the expected expansion of a number of years. This demonstrates in a graphic manner how the automobile trade and the public have responded to the appeal of specialized electrical service.

The company is the authorized service representative for the following products: Westinghouse starting, lighting and ignition, including the special Ford system; Connecticut ignition; Dyneto starting, lighting and ignition; K-W ignition; Philbrin ignition; Heinze two-unit starting and lighting for Fords; U. S. L. batteries, motors and generators; and Norma bearings, which are used in many of these electrical devices.

F. L. Spohn, special service representative of the Westinghouse company in Chicago, makes his office with the Jones company, so that the latter is able to co-operate closely and effectively with the manufacturers.

The local concern also has its men in the field, calling on dealers handling cars in which equipment of which it is the authorized representative is used, getting in touch with them and arranging to look after their work. Recently one of these men was sent all over Illinois with a Ford car equipped electrically with the appliances handled by the Jones company, advertising its service and promoting its business.

The Jones plant is equipped with all of the machinery and appliances needed to take care of every kind of work in its field. It has a large machine shop devoted largely to rewinding armatures and machining brackets and other parts needed in the installation of equipment in old cars. Commutator repairs are made here, the commutators being placed in the lathes and turned down, while the same machines are also used for rewinding coils. Coil wire of all kinds is carried in stock for this purpose. There are eighteen benches in the machine shop, together with four lathes and three drill presses,



Window Display in Commonwealth Edison Company's Adams Street Electric Shop, Which Shows in an Attractive Manner the Various Electrical Devices That May Be Used to Advantage in the Equipment of a Summer Porch.

all of the machine tools being individually motor-driven. In addition to the standard machines there is a special armature winding device, built in the Jones shop, according to its special requirements, while a number of other special tools for armature work have been devised.

There is a special department devoted to testing motors and other apparatus, two outfits for this purpose, one of them installed by the Westinghouse company, being in use. Speed and ignition tests are made here, and there is a full equipment of meters of all kinds for the purpose of measuring resistance, etc. A large motor provides the power for the test benches.

The repair of magnetos is another important feature, a 120-volt magnet being in use, which enables magnetos to be remagnetized in a very short time.

A large amount of space is given over to batteries, an additional building, as a matter of fact, housing this department. In the new plant the basement will be used for battery repairs and special ventilating apparatus is being designed for the purpose of carrying off all fumes from this part of the plant. The present plant is fully equipped, however, and batteries can be built outright. Broken cells are replaced when necessary, and a large recharging outfit is also in use. Supplies of acids and other materials used in this work are carried in quantity.

Stock of Supplies Requires Capital.

An enormous stock of parts and supplies of all kinds is carried by the Jones company, and with the present price of metals and chemicals it is easy to understand that a considerable capital is needed for the operation of a business of this kind. In fact, it would be impracticable to start such a business without ample capital, as the main disadvantage of the ordinary garage is its inability to carry sufficient stocks of parts for electrical apparatus, in addition to those for the motor car proper.

The stock-room is well laid out and systematically operated. Revolving cabinets carrying parts have proved to be space-savers, while another good feature is the use of type trays, carried in a specially constructed cabinet. These are especially useful for handling very small parts. In fact, it has been suggested that printers' furniture is well adapted for use in the stock-rooms of the electrical concerns handling this kind of work. Part of the stock consists of special tools used by the machinists, these being issued on requisition, so that the disposition of all equipment of this kind is known. Time is saved, of course, in being able to supply drills, etc., immediately, instead of having to delay the job while another is purchased on the outside.

A feature of the Jones business consists of supplying equipment to take the place of that which is being repaired. Magnetos, starting motors, batteries and other kinds of equipment are placed in the cars of owners, no charge being made if the job is "service," and a small rental being collected if the defect is no fault of the manufacturer. This one feature, while it represents a considerable outlay in the form of investment, since the company has had to purchase the equipment outright, has been of great assistance in making a reputation for service. Sometimes, however, a car-owner leaves an old battery for repair and recharging, taking a good one in its place at a supposed rental of 25 cents a day and fails to return.

Electrical Accessories an Important Department.

Handling the repair end of electrical equipment has practically forced the Jones company into the accessory business, and selling electrical accessories has become an important department, which will be even more important when the new building is erected. Bulbs, for instance, are carried in complete array, single and double contacts and all voltages being in stock. Often an owner simply desires to replace a bulb, but it is pointed out to him that a blown bulb is a symptom of trouble which should be remedied. Consequently the necessary repair is made and the bulb sold with assurance that it will give service. The same is true of fuses, spark plugs, etc. Before a sale is made, proper attention to the automobile is given and in this way the owner is impressed with the ability of the company to render service.

Possibilities for the Electrical Concern.

The rapid growth and phenomenal success of the Jones company in Chicago suggests the possibilities of the field for concerns in other cities. Even where the manufacturers of electrical devices used on automobiles have their own service stations, as in Chicago, they are more than willing to make arrangements with a reliable concern to look after this work either exclusively or in connection with their own forces. And in the smaller communities, where direct representation by factory service stations is not possible, the electrical concern specializing in the automobile field should have no trouble in making desirable connections.

A Companion Window Display to the One Shown on the Preceding Page. It Is Timely in a Two-Fold Way, Reflecting National Spirit and the Approach of the Fan Season. Many of the Flags Were Attached to Fans in Operation.

New Electrical Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Improved Fitting for Outside Conduit Construction.

A galvanized weatherproof fitting particularly adapted for conduit service entrance to buildings is shown in the accompanying illustration. It can be used where a neat, short right-angled turn is required and also can be used for a pull box.

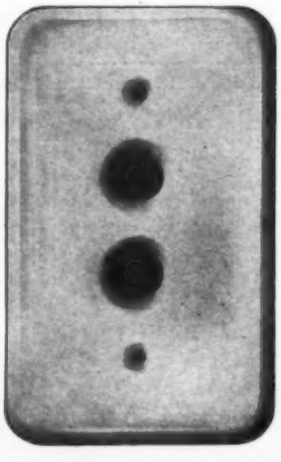
Improved Fitting.

This improved fitting has a smooth interior finish with rounded corners, permitting an easy passage of wires without chance of injury to the insulation of conductors. The closure cap has a smooth interior flange, and when seated tight on the fitting, which is also turned smooth, insures a perfectly waterproof outlet box.

This style of fitting is known as Type "Y" and is manufactured by the Utility Fittings Company, 812 Walnut Street, Philadelphia, Pa., in sizes to fit one-half to four-inch conduit. It has been approved by the Underwriters' Laboratories.

Porcelain-Enameled Switch Plates.

The ordinary brass and nickeled flush face plate for wall switches is apt to become tarnished from much fingering of the switches. This spoils its effect, particularly in hospitals, high-class homes, offices, etc., where spotless finish is desired at all times. This matter has been happily solved by means of a new line of switch plates with porcelain-enameled finish.



Switch Plate with Procelain-Enamel Finish.

These plates are said to have a permanent and practical finish which is more sanitary than the metal finish because so readily kept clean.

These switch plates can be finished in various colors to match the decorative finish in different rooms. They are furnished in single units and also in two-gang and three-gang sets by the Luminous Unit Company, 2615 Washington Avenue, St. Louis, Mo.

A New Line of Insulating Varnishes and Machine Enamels.

Insulating varnishes are finding an increasing use in the electrical industry, not only for building new machinery and apparatus but also in connection with repair and maintenance of such equipment. A new line of such products has been placed on the market by the Handy Supply Company, 11737 Detroit Avenue, N. W., Cleveland, O. This company has been increasing its line of supplies for the operating and maintenance electrician. This new line of varnishes and enamels is known as the "Hasco" and consists of six products: possesses unusual elasticity and high insulating properties.

"Handylac" is a clear air-drying insulating varnish, which dries directly after an application in from 5 to 15 minutes sufficiently so that the object that has been treated can be handled. Inside of 30 minutes it dries to a hard finish. This compound is particularly adapted to painting the slots in commutators so as to exclude oil, moisture and dirt. This varnish has been found to be specially suited for this purpose, as it will not gum a commutator stone which may subsequently be used to clean the surface of the bars after the varnish is dry and set.

"Handyvar" is a black air-drying insulating varnish. It also dries sufficiently for handling in from 5 to 15 minutes and dries to a hard finish in 20 to 30 minutes. This material is of special value for all quick repair work and as a finishing coat to cover insulation defects and also to exclude oil and moisture.

"Two-Hour Clear" and "Two-Hour Black" are varnishes that are similar to Handylac and Handyvar, respectively, but they have greater elasticity and greater penetrating qualities.

"Handylastic" is a black, baking, insulating varnish which possesses unusual elasticity and very high insulating properties.

All of the products mentioned in the foregoing are said by the manufacturer to possess unexcelled heat-resisting qualities and to possess insulating properties which are believed to be superior to any other insulating varnish on the market.

"Handynamel" is also a new product placed on the market by the company. This is a special enamel for painting the frames of motors and generators and also other power-house equipment. It dries over night and can be furnished in various colors with either gloss or egg-shell finish.

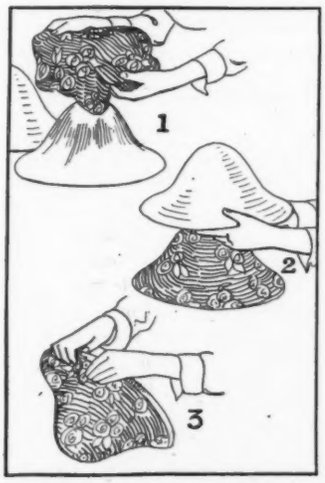
In the way of special commutator tools, the Handy Supply Company has been finding a very rapidly increasing demand for commutator stones and commutator files, it being evident that these products are giving complete satisfaction.

The Decolite—A Unique Type of Lighting Fixture.

The increasing desire of the modern housewife for artistic decorative effects in her home is bringing about the development of home furnishings of all kinds that readily adapt themselves to varied tastes and designs of home decorations. This idea is now being carried out in a new line of lighting fixtures being placed on the market by the Ivanhoe-Regent Works of General Electric Company, Cleveland, O. This line of fixtures is known as the "Decolite" because it can be used so appropriately for decorative purposes. The

most striking feature about these fixtures is that their design can readily be changed from time to time to suit an entirely new type of interior decoration, any special party or other social function, or even to satisfy a passing mood of the housewife. This has never been possible heretofore in metal and glassware fixtures that have been installed permanently.

The secret of the changeability of these new fixtures consists in their unique construction, which embodies two separate glass bowls held together by means of a metal ring and so arranged that between them can be inserted a piece of silk or cretonne. By changing this insert it is thus readily possible to change the entire decorative effect of the fixture. These fixtures are made in some half dozen different sizes and shapes, some having shallow, others deep bowls and some



Three Steps in Assembling Decolite Fixture.

Decolite Fixture Complete.

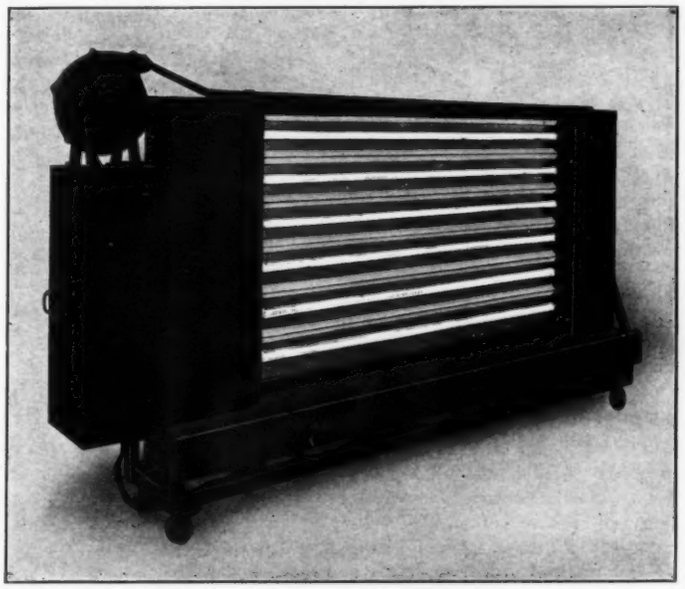
urn-shaped bowls. A pattern is furnished with each size and type of fixture. This permits cutting the fabric to exactly the right shape and size. The fixture is very easily assembled and any housewife can readily take it apart and change it as she wishes. The fabric is first placed over the inner bowl, after the latter is inverted on a table. This bowl has prismatic ribs upon it which serve to reflect most of the light upward toward the ceiling, thus making the fixture a purely semi-indirect fixture. After the fabric has been smoothed over this bowl, the smooth outer glass bowl is placed over it. Finally the metal rim that holds the two bowls and fabric together is adjusted and clamped in place. The double bowl is then ready to be rehooked to the supporting chains.

It will be seen from the foregoing that since most of the light is reflected upward against the ceiling, it makes relatively little difference in the lighting result whether the fabric used is of light or dark color. A velvet finish can be obtained for either bowl, if desired, for enhancing the richness of the effect obtained.

Cooper Hewitt Outfit for Rotogravure Printing.

For use in connection with the making of rotogravure prints, in which all newspapers are greatly interested at present, the Cooper Hewitt Electric Company, Hoboken, N. J., is marketing a special outfit, of which the one illustrated is typical. This outfit was built for the New York *Times*. It consists of six 67-inch, seven-ampere, mercury-vapor tubes mounted in a stand, the auxiliaries with shifters being mounted at the end of the stand beneath the blower, as shown.

Rotogravure prints are made from metal at the rate of about 3500 per hour. The process of making the print consists of using for copy anything that would make a good halftone. From the copy a negative photographic plate is first made. From this a positive is made, which is the reverse of the negative. This positive is a gelatine film and goes directly to the layout table to be assembled by experts on glass in its proper relation and position with other negatives. When properly assembled, it is brought into contact with a carbon tissue which is a gelatine-covered sheet of paper. The carbon



Cooper Hewitt Lamp Outfit for Rotogravure Printing.

tissue is then printed from the positive by means of a strong light, and it is for the purpose of furnishing the required light that this Cooper Hewitt outfit is being utilized.

Closer Co-operation Between Hess-Bright and S. K. F. Ball Bearing Companies.—In line with plans made last autumn when certain New York interests previously interested in the S. K. F. Ball Bearing Company also acquired an interest in the Hess-Bright Manufacturing Company, Philadelphia, it is now announced that plans have been perfected for a closer co-operation between these two leading concerns in the ball bearing industry. The affairs of the two companies will be administered by a recently formed New York corporation, the S. K. F. Administrative Company, 1 Wall Street. B. G. Prytz, who as president of the S. K. F. Ball Bearing Company, has been active in bringing about the fusion of the companies, has been elected president of the Administrative Company. Budd D. Gray, president of the Hess-Bright Company, has resigned to become technical adviser of the new corporation. Mr. Prytz was elected to succeed Mr. Gray as president. The S. K. F. Administrative Company is extending the manufacturing facilities of both the Philadelphia and Hartford plants, the demand for the company's products continuing to be so far in excess of the present supply.

Holophane Reflector-Refractor for Large Mazda Type C Lamps.

A crystal glass unit for large type C Mazda lamps that is both non-glaring and highly efficient is one of the latest additions to the Holophane line of scientific lighting glassware. It is a semi-inclosed unit that has all the advantages of diffusion with the ability of directing the light into useful directions.

This reflector-refractor No. 2130, as it is called, completes the line of this type, providing a fixture for the 300,

Fig. 1.—New Holophane Reflector-Refractor for 300 to 500-Watt Type C Mazda Lamps.

400 and 500-watt lamps of the same design as is already on the market for the 100 and 200-watt lamps in the No. 2110 and 2120 sizes.

The glass is in two parts—the upper being a prismatic reflector that reflects the upward light of the lamp into a downward direction similar to the regular Holophane prismatic reflectors. The lower section consists of concentric prisms that serve the double purpose of shielding the lamp filament from the eye and also re-directing the light at an angle of

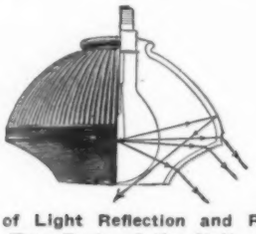


Fig. 2.—Diagram of Light Reflection and Refraction by the Two Parts of the Unit.

about 45 degrees. Fig. 2 illustrates the action of these two sections.

A large part of the light from the upper section and from the lamp at low angles passes through the opening in the bottom. The direct light from the filament that usually causes glare is intercepted by the refractor, bent down into useful directions and sufficiently diffused to eliminate glare. To further decrease glare and to improve the appearance of the unit a special "velvet finish" is applied to the inner surface.

The two parts are securely held together by small, nickel-finished clamps that engage the horizontal prisms by a bolt

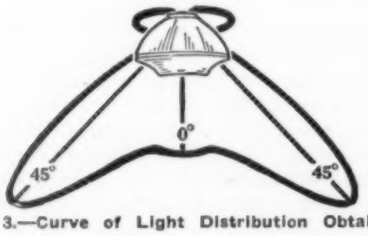


Fig. 3.—Curve of Light Distribution Obtained.

passing through the glass. A spun-brass hood with a porcelain mogul socket is also furnished and, if desired, a complete fixture with canopy, hickey, chain and hood, including mogul socket.

This unit is suitable for schools, offices, stores, etc., where an attractive fixture is desired and especially in locations where "daylight" lamps are used. As the unit is of crystal velvet-finish glass no distortion is caused in the color of the light.

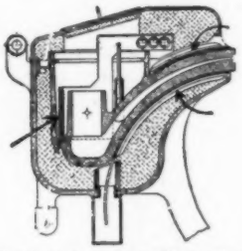
The large opening in the bottom makes relamping easy and the smooth, sloping inner surface of the refractor prevents accumulations of dust and insects, assuring a fine appearance and high efficiency.

The glass unit is 12.25 inches in diameter, 8.25 inches high and requires a four-inch fitter.

These units are manufactured by the Holophane Glass Company, Incorporated, 340 Madison Avenue, New York City.

The Electric Linotype Pot a Good Central-Station Load.

Of the standard line of Cutler-Hammer industrial heating devices, the electric linotype pot in particular has come into extensive use. There has existed for years back a desire to get away from the gas-heated pot. Both electric lighting companies and printing and publishing houses have investigated the electric pot. It furnishes a desirable load for the central station and is of good use to the printer because the automatic temperature regulation gives him better slugs and at the same time electric heat makes his rooms odorless, cooler, and more sanitary. While the machine is in operation the current input



Section Through Electric Linotype Pot, Showing Arrangement of Heating Element.

is 600 watts and since these machines operate from 8 to 12 hours per day, a steady non-fluctuating load is the result and in many newspaper publishers' plants this load is between midnight and morning. When the metal is cold, the input for about 50 minutes is about 1600 watts. It can readily be seen that a considerable yearly revenue is given the central station where even but a few of these electric pots are in service; as few as 20 pots furnish a yearly load of over 50,000 kilowatt-hours.

There are many advantages peculiar to the electric principle of heating. It is primarily clean, safe, quick, economical, and easily controlled, as there is an absence of open flames and the resultant products of combustion.

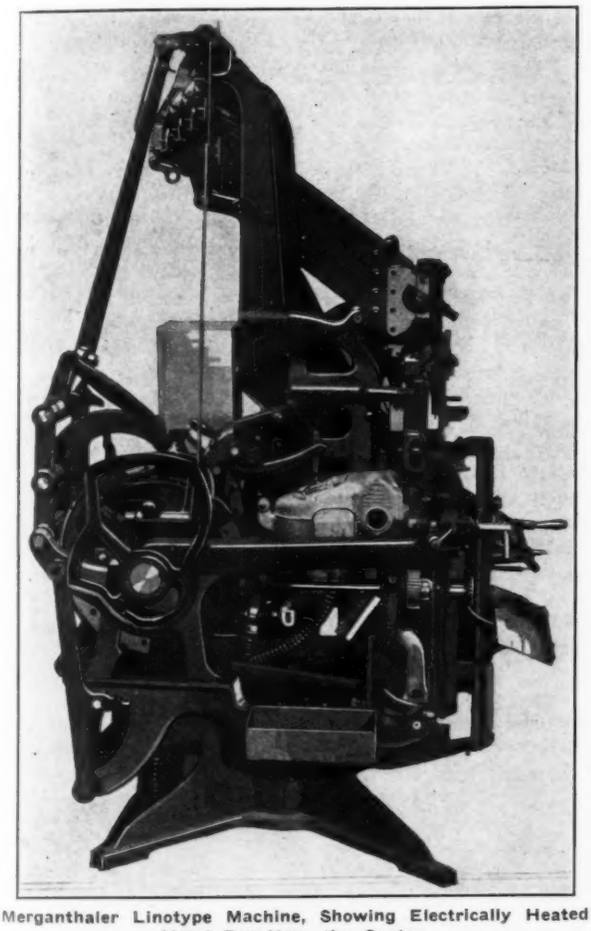
The Cutler-Hammer electric linotype pot in its principle of applying heat to the linotype crucible is a distinct departure from old methods. The heater is known as the immersion type, being immersed directly in the metal instead of being applied to the outside of the crucible. The immersed heater permits of no radiation except through the metal, thus making economical and comfortable operation. As the metal is uniformly heated from within the crucible, a high temperature can be applied at the start, and the metal can very quickly be reduced to a fluid state. The C.-H. pot delivers the molten metal to the casting point at the exact temperature registered in the crucible, which, it is claimed, insures a perfect molding of each character, and slugs that are solid and close-grained.

The heating units are in sections, inclosed in cases of a

special grade of steel. Two sides and all the edges of the cases are autogenously welded, making the structure liquid-tight. Two sets of heating units are immersed in the metal in the crucible. The entire surface of the pot, throat and mouthpiece over which the molten metal flows, is heated by units on the upper and under side.

To minimize heat losses by radiation, effective heat insulation is required. The immersion principle of the C.-H. pot allows the full space between the crucible and jacket, formerly occupied by the gas burner, to be utilized for heat insulation. This confines the greater percentage of heat generated to the crucible and reduces the consumption of electric current.

Automatic temperature control is secured by the joint action of a dynamic thermometer and a magnetic switch panel. The bulb, or the temperature-responsive portion of the



Merganthaler Linotype Machine, Showing Electrically Heated Metal Pot Near the Center.

thermometer, is immersed in the crucible at a point most sensitive to temperature variations. To the bulb is attached a capillary tube leading to an operating coil in the control panel. These parts are of a special steel welded together into a system without joints. The free end of the operating coil governs the movement of a lever which controls a magnetic switch and the flow of electricity.

The bulb, the capillary tube, and operating coil are filled with mercury and sealed. The liquid expansion of the mercury causes the operating coil to move a lever to a contact, upon touching which the magnetic switch cuts off the current. As the temperature decreases, the mercury contracts and the coil operating swings the lever back, closing the heating circuit. Thus, the heating current is automatically cut in and out and the temperature of the metal held within twelve degrees above or below the mean operating point.

The *New York World*, after a series of tests, equipped its entire battery of 56 linotypes with the Cutler-Hammer pot. On the United States battleship *Wyoming* a Mergenthaler linotype equipped with a C.-H. pot is installed and used in printing the Wyoming's magazine, called *The Coyote*.

The metal pots described are of standard design and construction, which makes them applicable to all outstanding linotype machines, of which there are about 20,000. The pots are made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., and sold by the Mergenthaler Linotype Company, New York City.

New Electrical "Stunts" for Enlivening Initiation Ceremonies.

To relieve the solemnity of the initiation ceremonies for lodges, clubs and various other organizations, it has come to be the custom to introduce various "stunts," which, incidentally, aim to test the qualifications of the candidate in a humorous but effective manner. No stunts of this character are as mirth-provoking and effective as those of an electrical nature. Special attention to the development of such harmless means of creating fun at festivities of this kind has been given by John J. Odenwald, 1204 H Street, N. W., Washington, D. C. Mr. Odenwald is a prominent electrical contractor in the capital city who has improved his spare time in devising many original electrical stunts, two of which were described in our issues of February 13, 1915, and November 25, 1916. The one described in the former article was a very innocent chair which suddenly livened the candidate into great activity when he undertook to sit down. The second was a simple weight to test the physical prowess of the candidate and incidentally impose on him, when he began to demonstrate his strength, a very lively high-tension electrical charge.

Mr. Odenwald has now added to his line of electrical devices of this character a number of new and very interesting ones. One of these is a punch bowl from which the candidate is asked to serve. Upon touching the ladle he receives a lively electrical jolt which shows him that the liquid has a real "punch." Another is a harmless looking rug in which are woven electrical wires and terminals secretly connected to a high-tension spark coil which makes the initiate do some lively stepping when everything is in readiness. Still another is a wheelbarrow on which the candidate is brought into the presence of his new brethren. On approaching, the person who is wheeling the barrow quietly presses a secret button in one of the handles which operates a three-inch electric bell to warn everyone to clear the path. This also serves to direct attention to the startling event which happens when another secret button is pressed that causes the candidate to arise with great alacrity, due to some very sudden applications of high-tension charges manifesting themselves in the seat of the barrow. Another device is a pair of Dutch sabots, or wooden shoes, which are very harmless looking and yet when worn cause the wearer to suddenly become a dancer of very funny jigs. Still another new stunt is a climbing rope upon which it is customary to place about 15 feet or so above the floor a fez or other suitable object, which the novice is expected to climb to and bring down. After climbing the rope some four or five feet, current from a magneto is suddenly applied to hidden terminals in the rope which makes the candidate come down with considerable speed.

All of these devices are exceptionally well made and are so constructed that the electrical features are entirely hidden, in many cases being entirely self-contained in the device. In other cases arrangements are made for connecting the device to either a high-tension spark coil or a powerful magneto. Mr. Odenwald has established a reputation for not only the originality of his electrical stunts, but also the excellent construction thereof and the satisfaction which they give to organizations seeking devices of this character.

Activities in the Trade

American Conduit Company, 140 Nassau Street, New York City, has commenced the erection of a new plant at Fulton, N. Y.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Catalog 38, on small motors and generators.

Moore Steam Turbine Corporation, Wellsville, N. Y., has increased its capital from $160,000 to $260,000 for business development.

The Giese Art Metal Works, Philadelphia, Pa., manufacturer of lighting fixtures, has removed to new quarters at 4414 Germantown Avenue.

McGill Manufacturing Company, Valparaiso, Ind., has prepared a folder on "Loxon" lamp guards, a type of wire guard for protecting incandescent lamps.

Globe Stove & Range Company, Kokomo, Ind., has prepared its catalog No. 39, showing a complete line of electric ranges, hot plates, cake griddles and flatirons.

Western Electric Company, New York City, is sending to the trade a mailing folder announcing the manufacture of a new 6½-pound electric flatiron that has several distinctive features.

Babcock & Wilcox Company, Bayonne, N. J., is planning the erection of an addition to its boiler manufacturing plant. The company has recently completed extensions costing about $225,000.

The Electric Equipment Association, 216 Judge Building, Salt Lake City, Utah, has been formed by Arthur Purdon. The company will represent the Electrical Engineers Equipment Company, of Chicago, Ill.

Driver-Harris Wire Company, Middlesex Street, Harrison, N. J., manufacturer of electrical wires, has increased its capital for business expansion. The company has also changed its name to the Driver-Harris Company, Incorporated.

MacGovern & Company, 114 Liberty Street, New York City, have prepared a list of new and used turbogenerators, generating units, motors, switchboard apparatus and other electrical machines and power equipment for sale by the concern.

John C. Dolph Company, Newark, N. J., manufacturer of insulating and protective varnishes, announces the completion of additions to its plant which will double the capacity. These include new executive offices and a new enlarged insulating laboratory.

H. T. Electric Company has removed from its old location at 324 North Delaware Street to 617 North Capitol Avenue, Indianapolis, Ind., where the company has increased floor space and improved facilities for electrical work on automobiles and tractors.

General Electric Company has awarded a contract for the erection of its proposed new plant on Lillie Street, Newark, N. J., to the F. W. Mark Construction Company, Philadelphia, at a cost of $360,000. The structure will be of reinforced concrete and brick, four stories and basement, about 82 by 510 feet.

Bradford-Ackermann Corporation, New York City, has just issued Bulletin No. 101, which illustrates and describes the new "Astra" oxy-illuminating-low-pressure gas apparatus especially designed for lead-burning purposes. This apparatus is designed particularly for storage-battery service stations and other similar places where lead burning, hard tempering, etc., is done.

Templeton, Kenly & Company, Chicago, Ill., have prepared folders descriptive of their Simplex jacks for pulling and straightening poles. This efficient tool is used by a large number of utility companies and has effected marked economies in pole-line maintenance.

McCausland Engineering Company, Pennsylvania Building, Philadelphia, Pa., has awarded a contract for the construction of its proposed new plant on Fifth Street, Chester, Pa., for the manufacture of electric motors. The plant, to cost about $50,000, will consist of three main buildings.

Pass & Seymour, Incorporated, Solvay, N. Y., will commence the immediate construction of the proposed new addition to its works. The building will be reinforced concrete, three stories, about 60 by 185 feet. The H. D. Best Company, 52 Vanderbilt Avenue, New York City, has the contract for erection.

National Conduit & Cable Company, 41 Park Row, New York City, has organized its directorate as follows, with the officials of the company as named: Edward S. Perot, president; Edward S. Perot, Jr., vice-president; Morton A. Howard, secretary; George J. Jackson, chairman of the board; Albert H. Wiggin, C. E. Mitchell, Andrew Fletcher, Stephen Millett, Robert Montgomery and Hugh K. Pritchitt.

Electrose Manufacturing Company, Brooklyn, N. Y., has recently issued a number of special publications among which is a booklet giving reprints of articles dealing with the use of Electrose insulating materials on power transmission lines, at the Arlington radio station and on United States battleships; reprint of the report of the Electrical Testing Laboratories on high-voltage tests of Electrose insulated connectors for W. S. Barstow & Company; reprint of an article on "High-Frequency Tests of Line Insulators," by L. E. Imlay and Percy H. Thomas, and bulletin No. 14 which lists, describes and prices the different styles of insulators, insulated pins and other Electrose products manufactured by the company.

Harvey Hubbell, Incorporated, Bridgeport, Conn., has issued its new catalog of electrical specialties which comprises 125 pages with several thousand illustrations. This catalog, No. 16, is a noteworthy publication in trade literature because of the unique way in which it is arranged and also for the excellence of the illustrations and printing. Knowing that devices illustrated in catalogs have the largest sales, outside of cases where actual samples are seen by the purchaser, the company was determined to show by at least a small cut exactly how every one of the multitude of its electrical devices really looks. For instance, in sockets and pull switches of the "Quick-Catch" type there are available 30 types of caps or bases and 7 different bodies, all of which are interchangeable, thus making 210 different combinations from these 37 elements. All of these are shown, the caps or bases at the top of the page and the bodies at the left margin; by following down the column to the corresponding horizontal row one finds a cut of any desired combination. This idea is carried in all of the lines of interchangeable sockets, receptacles, plugs, current taps, reflectors, etc. The new reflector line was described in our issue of April 28, 1917. It covers 24 pages of the catalog. There are also included the Hubbell lines of shadeholders, lamp guards, cord connectors, etc. Three pages give conduit fittings suitable for Hubbell sockets, pull switches and plug receptacles, and 25 pages are devoted to indexes of catalog numbers, etc.

Personal and Biographical

HAROLD R. WILBUR, Lambertville, N. J., manager of the Lambertville Public Service Company, has been appointed general manager of the properties of the National Utilities Company in New Jersey, including the local power station and plants at Dover and Newton.

A. P. McCARTHY, Coatesville, Pa., local manager for the Philadelphia Suburban Gas & Electric Company, has been transferred to Pottstown, to occupy a similar position. He will be succeeded at Coatesville by N. B. BERTOLETTE, formerly assistant to the manager of the company at Jenkintown.

CHARLES E. FASOLDT, Rensselaer, N. Y., formerly connected with the General Electric Company at Schenectady, has been appointed engineer of power and lines of the Union Traction Company, Albany, succeeding H. J. CHILDS, who has resigned to become electrical engineer for the Chauteaugay Ore & Iron Company, Lyon Mountain, N. Y.

P. D. KLINE has become manager of the Wisconsin-Minnesota Light & Power Company's utility properties in La Crosse, Wis., succeeding J. N. MONCRIEFF, who resigned to accept a managerial position with a New York utility company. Mr. Kline formerly was located in Ogden, Utah, where he had charge of the construction and operation of the Ogden, Logan and Idaho Railway.

JOHN R. CHADWICK was appointed superintendent of the Lux Manufacturing Company, Hoboken, N. J., recently. Mr. Chadwick formerly was identified with the Westinghouse Lamp Company as assistant superintendent of its New York Works, having been associated with that organization for over 20 years. His addition to the operating force of the Lux company is to be considered a valuable one, and in keeping with the progressive policies of that company.

J. R. Chadwick.

W. J. KERR, formerly with W. D. Hord, investment bankers, New York City, has joined the bond department of H. M. Byllesby & Company, Chicago.

B. J. SHOCKLEY, for ten years resident manager at Fremont, O., for the Ohio Light & Power Company, Newark, has resigned. He is succeeded by J. P. BOYD.

CHARLES M. CROFOOT has been transferred from the post of district sales manager of the Cincinnati office to the New York City office of the Crouse-Hinds Company.

E. T. ROWLAND has been appointed new-business manager, Continental Gas & Electric Corporation, Omaha, Neb. Formerly he was connected with the United Illuminating Company, New Haven, Conn., as sales manager.

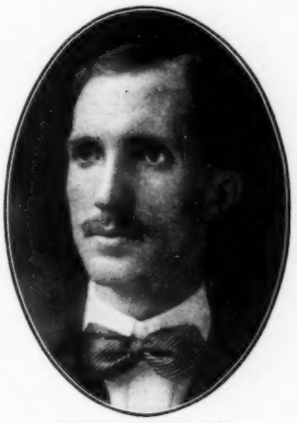
FRANK BAACKES, vice-president and general sales manager of the American Steel & Wire Company, delivered an address on "Present Conditions" before the recent convention of the American Hardware Manufacturers' Association and Southern Hardware Jobbers' Association in Houston, Tex., in which he summed up present business conditions and pointed out what effects the war would likely have on American merchants.

B. H. COLLINS, well known in the advertising agency field, has joined the publicity staff of the Society for Electrical Development. He takes the place of HILL GRIFFITH, first lieutenant in the cavalry, Officers' Reserve Corps, who has been called into active service. Mr. Collins has had wide experience with sales promotion and advertising work, and has been connected with the financial departments of some of the larger public utility interests.

MR. WALTER ALEXANDER of Milwaukee, has resigned as a member of the Wisconsin Railroad Commission, which has control over all public utilities in the state. Mr. Alexander will succeed MR. A. E. MANCHESTER as superintendent of motive power, Chicago, Milwaukee & St. Paul Railroad, with headquarters in Milwaukee. He was appointed to the Railroad Commission about two years ago, prior to which time he was in the employ of the railroad company as assistant to Mr. Manchester.

A number of changes are noted in the personnel of the Indiana Public Service Commission. The following appointments have recently been made: JOHN W. McCARDLE, formerly a member of the Indiana Board of Tax Commissioners; WILLIAM J. WOOD, formerly a special examiner for the Interstate Commerce Commission and prior to that chairman of the Indiana Railroad Commission; CARL H. MOTE, former editor of the Indianapolis *Sun* and later engaged in statistical work for public service corporations and in magazine and newspaper work; ERNEST I. LEWIS, formerly a special correspondent for the Indianapolis *News*.

E. H. MARTINDALE is one of the four managers elected to the board of directors at the annual business meeting of the American Institute of Electrical Engineers in New York City May 18. Since August, 1916, he has been chairman of the Industrial and Domestic Power Committee. After graduating from Case School of Applied Science in 1908, Mr. Martindale was connected successively with Illinois Steel Company, Gary, Ind.; Gregory Electric Company, Chicago, Ill., and Commonwealth Edison Company, Chicago, Ill. In October, 1909, he joined the engineering staff of National Carbon Company, Cleveland, O., where he is now sales engineer. He is also vice-president and treasurer of Handy Supply Company, Cleveland, O. Mr. Martindale is now writing a series of fourteen articles for ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, covering in detail the operation of motors and generators, the first of which appeared in the issue of March 24.



E. H. Martindale.

ALFRED F. MARCH, New Brunswick, N. J., has taken a seat as member of the Board of Public Utility Commissioners, May 1, succeeding JOHN J. TREACY, whose term of office has expired. RALPH W. E. DONGES has been re-elected president of the Board.

Obituary.

L. R. POMEROY, consulting railway and electrical engineer, died at his home in Orange, N. J., May 7, aged 60 years. He was a graduate of Irving Institute and entered the railway field, being connected with several steel companies and devoting his time to railway problems. In 1902 he became associated with the General Electric Company as a special representative in the railway field, concerning himself with the electrification of railways. In 1908 Mr. Pomeroy was connected with Safety Car Heating & Lighting Company, leaving in 1910 to become engineer of the railway and industrial division of J. G. White & Company. In 1911 he established offices in New York City as consulting engineer.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

PORTLAND, ME.—The Cumberland County Light & Power Company has asked authority of the Public Utilities Commission to issue $440,000 worth of bonds to meet expenditures already made and for improvements to the extent of $207,000 to be made this year.

SOUTH BERWICK, ME.—The Berwick & Salmon Falls Electric Company has been authorized by the Public Utilities Commission to issue $61,500 in bonds and $4,600 in stock to provide for the purchase of a waterpower site formerly owned by the White Mountain Paper Company.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company is installing a new 3,500-kilowatt generator, with boilers and auxiliary equipment, at its local power station. Another unit of similar rating will also be installed at an early date. The company has commenced construction on a new 33,000-volt transmission line from the power station to a new substation, to be completed at the time of placing the new plant in operation.

POUGHKEEPSIE, N. Y.—The Poughkeepsie & Wappingers Falls Electric Railway Company has increased its capital stock from $750,000 to $1,000,000. Plant betterments are contemplated.

BAYONNE, N. J.—The City Commission has made an appropriation of $22,800 to $57,000 for street lighting and street-lighting work in its budget for the current year.

DOVER, N. J.—The New Jersey Power & Light Company has secured a fund by a note issue of $50,000 for proposed extensions. E. E. Yensel is general manager.

HOPEWELL, N. J.—The Borough Council is planning the installation of new gas-engine machinery at its waterworks, replacing present gasoline equipment.

JERSEY CITY, N. J.—The North Bergen Township Committee has granted a franchise to the New York Telephone Company for extensions in its conduit and aerial system in different parts of the township.

JERSEY CITY, N. J.—The Great Atlantic & Pacific Tea Company has made application to the City Commission for permission to construct an electrical conduit system from its plant on Provost Street to the factory of the Hartford Suspension Company, Morgan Street, and also to its plant at First and Warren Streets.

LAMBERTVILLE, N. J.—The Board of Public Utility Commissioners has granted the Lambertville Public Service Company permission to execute a mortgage for $350,000 and to issue bonds for $80,000 for extensions and betterments.

NEWARK, N. J.—The Livingston Township Commission is planning the establishment of a new street-lighting district.

NEWARK, N. J.—The Fire Board has authorized immediate improvements in the municipal fire-alarm telegraph system, including new underground cable installation.

NEWTON, N. J.—The Newton Tennis Club is planning the installation of an electric lighting system at its court to permit night play.

PERTH AMBOY, N. J.—The Board of Water Commissioners has adopted resolutions for a bond issue of $200,000 for extensions and improvements at the municipal waterworks, to include the following: new pumping engine and building, $53,000; new boilers and building, $35,000; dams, spillways and other work.

PERTH AMBOY, N. J.—The Board of Aldermen has authorized a bond issue of $50,000 for the continuation and completion of the municipal electric system of the city electric lighting plant. The board is also planning to perfect arrangements for the furnishing of commercial service in different sections of the city during the summer.

WESTMONT, N. J.—The Township Committee has granted the Delaware & Atlantic Telephone & Telegraph Company permission to install underground conduits in Haddon and Wynnewood Avenues.

CHESTER, PA.—The borough officials of Skippack have arranged for the installation of a street-lighting system to be used for all-night service.

CLAYSBURG, PA.—The Osterburg Light, Heat & Power Company has recently been incorporated to operate a system at Osterburg and vicinity. D. E. Brumbaugh is head of the company.

COATESVILLE, PA.—Subject to the approval of the Public Service Commission, the City Council has awarded a contract to the Chester Valley Electric Company for furnishing electric power for the operation of the city waterworks.

HARRISBURG, PA.—The Harrisburg Railways is considering extensions and improvements in its power plants.

PHILADELPHIA, PA.—The Philadelphia Drying Machine Company will build a one-story power house in connection with its new plant at Westmoreland and Stokley Streets.

PHILADELPHIA, PA.—City officials have rescinded a recent order requiring the city hall tower to be dark at night, effective with the entering of the country into the war, and have ordered the tower illuminated as heretofore.

BALTIMORE, MD.—The United Railways & Electric Company has awarded a contract to the West Construction Company for the erection of a substation, 60 by 90 feet, at Sollers Point.

SALISBURY, MD.—City officials have accepted one of the propositions submitted by the Eastern Shore Gas & Electric Company for street lighting for the city. The contract covers a period of three years. This new system will necessitate the rebuilding of considerable of the lines of the electric company, upon which they expect to begin work at once. It is proposed to have the system installed in six months.

BOWLING GREEN, VA.—The Bowling Green Light & Power Company has been incorporated with a $10,000 capital by L. E. Martin and others. The company will build a power plant costing $5,000 and a transmission line connecting Bowling Green and Milford, Va.

FARMVILLE, VA.—The city will vote June 14 on $50,000 bonds for electric lights, waterworks and street improvements. A 500-kilowatt power plant will be installed. W. M. Piatt, engineer, Durham, N. C., has charge of the plans.

WILMINGTON, DEL.—The Wilmington & Philadelphia Traction Company has commenced the operation of a system to furnish light and power to Newark and vicinity.

WASHINGTON, D. C.—The Bliss Electrical School, Takoma Park, is making additions to cost about $100,000. The work will include both structures and equipment.

WASHINGTON, D. C.—The Public Utilities Commission has granted the Potomac Electric Power Company permission to issue bonds for $1,047,500 for extensions and betterments in its plants and system.

CHARLESTON, S. C.—A transformer station, costing approximately $5,000, will be erected by the Charleston Consolidated Railway & Lighting Company.

SPARTANBURG, S. C.—The South Carolina Light, Power & Railways Company is planning a number of line extensions.

GAINESVILLE, GA.—The Southern Bell Telephone & Telegraph Company will expend $13,000 to erect an exchange, and $40,000 for other improvements to include the removal of wires from public square and the installation of a common-battery system.

NORTH CENTRAL STATES.

ANTWERP, O.—The Antwerp Electric Light & Power Company has been incorporated with a capital of $20,000 by W. J. Peterson, G. M. Bratton and others to furnish electric service here.

EAST PALESTINE, O.—The Ohio Gas & Electric Company has offered to buy the local lighting system for $30,000. If the sale is made the company plans to spend $625,000 for improvements. T. H. Munroe is president of the company.

GREEN SPRING, O.—Municipal bonds in the sum of $6,500 have been authorized for the purchase of the power plant of the Green Spring Electric Light & Power Company.

HAMILTON, O.—The Hamilton Electric Company has been awarded the contract for the installation of switchboards and other electrical equipment in the plant of the Peters Cartridge Company, King Mills, O., at an estimated cost of $25,000.

WATERVILLE, O.—A bond issue will be made to provide for the installation of an electric distribution system here.

FOUNTAIN CITY, IND.—Richmond business men are understood to be interested in the proposition presented to the Town Board by Charles Wiley, representing the Richmond Electric Company, for the erection of a distribution system to furnish electric light and power to several towns near here. W. M. Bailey and others are financially interested in the project.

GREENSBURG, IND.—Permission to improve the present lighting system was granted the Greensburg Gas & Electric Light Company by the City Council, when the contract with the company was amended. About $1,500 will be expended for improvements.

REDKEY, IND.—The Muncie (Ind.) Electric Light Company has entered into a contract with the Town Board to install 600-candlepower nitrogen-filled lamps to replace the present arc lamps for street lighting.

WINONA LAKE, IND.—The Winona Electric Light & Water Company has been granted permission by the Indiana Public Service Commission to issue $85,000 worth of bonds for improvements and other purposes.

DECATUR, ILL.—Bids will be received by the Board of Local Improvements May 10 for the installation of an ornamental lighting on the east side of South Main Street.

GALESBURG, ILL.—The Galesburg Railway, Lighting & Power Company has increased its capital stock from $3,500,000 to $4,000,000 to provide, among other things, for plant betterments.

MATHERSVILLE, ILL.—The Mathersville Light & Power Company will purchase new plant equipment.

BROOKLYN, WIS.—The Brooklyn Electric Company, in which H. J. Ellis is interested, has been granted permission by the Railroad Commission to use the poles of the Brooklyn Telephone Company for stringing an electric distribution system and will provide light and power service.

GREEN BAY, WIS.—The Railroad Commission has granted the Green Bay & Eastern Railway Company permission to construct an electric railway from Green Bay through Manitowoc to Sheboygan.

LITTLE FALLS, WIS.—The Little

Falls Water Power Company contemplates making extensions to its distribution system.

MADISON, WIS.—The street lighting committee of the City Council plans to extend the lighting system on several streets. A. Rupp is chairman of committee.

MADISON, WIS.—The Electric Properties Corporation of New York City, capitalized at $7,200,000, of which $250,000 is invested in Wisconsin property, has filed articles of incorporation with the secretary of state at Madison. Attorney C. E. Bake, Madison, is named as Wisconsin representative.

OSHKOSH, WIS.—The Oshkosh Gas Company has commenced the construction of its new electric power plant.

RACINE, WIS.—The Milwaukee Electric Railway & Light Company is having plans prepared for a brick and steel addition to its power house here, to cost $25,000.

RIPON, WIS.—The Wisconsin Light, Power & Milling Company of Eldorado and Rosendale has been sold to the Ripon Light & Water Company, of which W. A. Haseltine is president. The transaction was completed last week, and the new owner of the company has taken possession of its property and will conduct the business hereafter in connection with the Ripon company. The deal includes the company's power plant, which is located at Eldorado, and about five miles of transmission line. Lines are to be built from Ripon to Rosendale by the Ripon company, and instead of operating the Eldorado plant all the time, much of the power used in the two villages served will be supplied from the Ripon power plant.

SHAWANO, WIS.—Manager Caproa of the municipal electric plant has recommended improvements to the plant, which include a 250-horsepower engine-driven generating unit, motor-driven pumps and other equipment.

SHEBOYGAN, WIS.—The Wisconsin Electric Railway Company contemplates erecting an electric power plant.

SPARTA, WIS.—The Wisconsin-Minnesota Light & Power Company, which recently purchased the light and power plants at Sparta and Angelo from O. I. Newton Sons Company, will connect the plant in this city with the power station in LaCrosse. They are planning to build 90 miles of transmission line this year connecting Sparta, Tomah and LaCrosse with the plant at Nelson, Wis. Lines and poles for this extension will be ordered at once. It is estimated the cost per mile will be in the neighborhood of $3,500. A line is being put through from Sparta to Tomah to furnish power for Tomah, as the Goodyear Lumber Company of Tomah will soon be moved from there leaving the place without electric power.

STOUGHTON, WIS.—The city has begun operations at Stebbinsville, where it has purchased land and water rights for a power station. The cofferdams are now being installed.

CRYSTAL FALLS, MINN.—The Twin Falls Power Company will develop another power plant on the Brule River near Florence, Wis.

FT. DODGE, IOWA.—The Ft. Dodge, Des Moines & Southeast Electric Railway Company will expend $250,000 in extensions and improvements. G. H. Crowne is general manager.

WAPELLO, IOWA.—The Wapello Electric Light & Power Company's plant, owned by the Peoples Gas & Electric Company, of Burlington, was totally destroyed by fire recently, with a loss of about $10,000.

ST. LOUIS, MO.—The Union Electric Light & Power Company has been authorized to issue $8,040,000 in preferred stock for extensions. Of this amount $1,000,000 has been issued with the approval of the Missouri Public Service Commission.

ABILENE, KANS.—The Riverside Light, Power & Gas Company is selling an issue of preferred stock to provide for extensions.

SALINA, KANS.—City officials and Manager Harsh of the Salem Light & Power Company are considering plans for the illumination of the city park.

EMERSON, NEB.—The Nebraska Electric Company, Cedar Rapids, Iowa, has purchased the holdings of the Emerson Light & Power Company, and has retained Henry Jensen as local manager.

WHITE LAKE, S. D.—The proposition of issuing bonds in the sum of $10,000 for the installation of electric light plant will be submitted to voters here at an election to be held soon.

BEACH, N. D.—F. C. Hughes, of the Glendive Power, Heat & Light Company, has purchased the Beach Electric Company's plant from J. G. Robertson, of St. Paul. The plant will continue under the management of Hugh Hamilton.

DATES AHEAD.

Electrical Supply Jobbers' Association. Semi-annual meeting, Homestead Hotel, Hot Springs, Va., May 23-24. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Iowa Section, National Electric Light Association. Annual convention, Des Moines, Iowa, May 24-25. Secretary, L. E. Caldwell, Iowa City, Iowa.

Electric Power Club. Spring meeting, Homestead Hotel, Hot Springs, Va., June 11-14. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Electrical Contractors' Association of Pennsylvania. Annual convention, Philadelphia, Pa., June 19-21. Secretary, M. J. Sellers. 1518 Sansom Street, Philadelphia, Pa.

American Institute of Chemical Engineers. Semi-annual meeting, Buffalo, N. Y., June 20-22. Secretary. J. C. Olson. Cooper Union, New York City.

American Institute of Electrical Engineers. Annual meeting, Hot Springs, Va., June 26-29. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association, Annual convention, Breakers Hotel, Cedar Point, O., July 16-20. Secretary, D. L. Gaskill, Greenville, O.

SOUTH CENTRAL STATES.

PADUCAH, KY.—The City Commission has decided to ask for a vote on a bond issue to provide for a municipal light and power plant at the regular election in November. The amount to be asked was left open after Commissioner W. A. Gardner strenuously objected to $185,000, Commissioner Gardner insisting that the plant could be built for less money.

WALTON, KY.—E. L. Kelley, proprietor of the local electric lighting plant, has progressed in reconstruction and re-equipment of the plant burned some time ago, to the extent of being able to resume service. Citizens of the city subscribed $1,500 toward reconstruction of the plant.

WARSAW, KY.—A. B. Bradley has purchased the interests of R. B. Brown and O. A. Bogardus in the Warsaw Electric Light Company and is now sole owner.

LYNCHBURG, TENN.—B. C. Middleton is in charge of the project to erect a reinforced concrete dam to form a lake which will be a feature of a proposed resort at Cumberland Springs, near here. An electric power plant to provide light and power for the hotel and 65 summer homes is planned in this connection.

TREZEVANT, TENN.—On May 20 an election will be held in this city to vote on a bond issue to install an electric light plant and improve the waterworks plant. The enabling act calls for a $20,000 bond issue, but it is thought it will not be necessary to use the entire issue.

DOTHAN, ALA.—The proposition to supply the city of Dothan with electricity for light and power has been submitted to City Council by the firm of Foy & Schemwell, represented here by T. M. Espy and W. L. Lee. It is proposed to construct dams and establish hydroelectric plants at Bluett's Mill and Wood's Mill on Mercer Creek, and to furnish electricity at various towns in this section.

NATCHEZ, MISS.—Work has been commenced on the construction of an electric plant for Jefferson Military College, the contract being awarded to Brown & Henderson, of this city. Other building improvements are to be made at the college.

McALESTER, OKLA.—The Choctaw Power & Light Company is planning the erection of a transmission line to Gowen to furnish service there.

OKLAHOMA CITY, OKLA.—E. P. Truett of New York and Wardis Arnold of Chicago have commenced preliminary work on a large electric power plant to be built on the Canadian River near Shawnee. The plant will cost $500,000 and will supply electrical energy for several interurban lines out of Oklahoma City and other towns, and will also supply energy for light and power to Shawnee, Ada and Oklahoma City.

DENTON, TEXAS.—It is announced by E. P. Turner, of Dallas, who is at the head of the Dallas Northwestern Traction Company, that the Standard Utilities Construction Company, which was recently incorporated here, will construct the interurban electric line that is to run between Dallas and Denison, a distance of about 75 miles, the two companies being closely allied. The survey of the division is to run between Denton and Denison, a distance of about 40 miles, is now being made and construction will soon be started.

WESTERN STATES.

BISBEE, ARIZ.—The government is putting in a telephone line from Bisbee to Fort Huechuca.

CALDWELL, IDAHO.—The Caldwell Traction Company plans to bond its properties for $100,000 and expend this sum in electrifying its Wilder branch.

LEWISTON, IDAHO.—The City Council has accepted the proposal of the Lewiston Lighting & Power Company to install an ornamental lighting system in the business district of the city. The new system will cost $15,000.

SEATTLE, WASH.—The Stone & Webster interests have leased a site on Harbor Island here with a view to building wooden ships.

SEATTLE, WASH.—The contract for furnishing and installing equipment for the addition to the city steam power plant on Lake Union was awarded to Charles C. Moore & Company Mutual Life Building, on a bid of $219,000.

SEATTLE, WASH.—Oliver T. Erickson, chairman of the Public Utilities Committee, has presented his annual report in which he recommends the appropriation of $50,000 for the central substations and $75,000 for distributing stations.

SEATTLE, WASH.—The Board of Public Works has purchased from the Westinghouse Electric & Manufacturing Company electrical machinery for operation of the East Lake Avenue steel bridge at $19,707.

SEATTLE, WASH.—The city of Seattle has decided to give up claims to power site on the Sultan River with a view to permitting the Sound Paper Company to develop water power there at a cost of $6,000,000 for the operation of a paper mill in Seattle.

TOPPENISH, WASH.—The City Council of Wapato has granted a 50-year light and power franchise to the Pacific Power & Light Company.

EAGLE ROCK, CAL.—The Board of Trustees has called for bids on a 50-year street railway franchise for Colorado Boulevard, between Central and Boland Avenue.

FRESNO, CAL.—The San Joaquin Light & Power Company is erecting a new substation at Chowchilla. The station at Henrietta will be duplicated, thereby doubling its capacity, and other improvements are contemplated throughout the system.

GONZALES, CAL.—Antone Badasci is installing an electric pumping plant to pump water for irrigation.

HANFORD, CAL.—The San Joaquin Light & Power Company will build an electric power line to connect the Gifford district with its distributing system. A line will also be extended to the Sunset Colony.

LOS ANGELES, CAL.—The Police Commission has recommended the installation of electric lamps in the rear of downtown office buildings on alley and vacant lot sides.

LOS ANGELES, CAL.—The City Council has passed resolutions approving a ten-year contract, subject to the vote of the people, on the issuance of $12,000,000 in bonds for the purchase by the city of the property of the Southern California Edison Company and the Pacific Light & Power Company systems.

LOS ANGELES, CAL.—The San Joaquin Light & Power Company has been authorized to execute a trust agreement

with the Security Trust & Saving Bank, securing $4,500,000 six-per-cent debentures. Bonds amounting to $1,000,000 are to be sold immediately at not less than 95 per cent of their face value to raise funds for an extensive campaign of reconstruction and development being launched by the company.

OAKLAND, CAL.—The Great Western Power Company has been made the defendant in a suit for the recovery of a $100,000 franchise tax claimed by the city of Alameda, which started the action.

STOCKTON, CAL.—The Western States Gas & Electric Company has applied for permission to use 5,000 acre-feet from Medley Lake and 7,000 acre-feet from Echo Lake, both in El Dorado County, and 8,000 acre-feet from Twin Lakes in Alpine County for the purpose of developing power at the American River Electric Company plant.

PROPOSALS

ELECTRICAL WORK.—The Board of Education, Hoboken, N. J., will receive bids until May 29 for electrical work to be installed in the new public school to be erected on Adams Streets, with bids for construction and other work at the same time. William A. Kerr, secretary.

ELECTRICAL WORK.—Bids will be received until June 2 by the Board of Education, Redfield, S. D., for the electrical work on the new high school building to be erected there. Plans and specifications may be obtained from W. B. Ittner, architect, Board of Education Building, St. Louis, Mo.

STEEL TOWERS.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 28, for constructing three 600-foot steel towers with concrete footings at the United States naval radio station at El Cayey, P. R. Plans and specifications can be obtained from the bureau or the commandant at the navy yard, New York City.

ELECTRICAL WORK.—Proposals will be opened in the Supervising Architect's office, Treasury Department, Washington, D. C., at 3 p. m., May 28, 1917, for changes in plumbing, gas piping, conduit and wiring and lighting fixtures, in the United States post office at Beaver Falls, Pa., in accordance with the specification and drawings, copies of which may be had at that office or at the office of the custodian, Beaver Falls, Pa., in the discretion of the Supervising Architect. James A. Wetmore, Acting Supervising Architect.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 1098, various stations, 72,450 flashlight batteries, and 18,800 flashlights without batteries. Schedule 1103, Las Animas, Colo., one electrically operated dishwashing machine and one electrically operated potato peeler. Schedule 1111, various stations, miscellaneous turbogenerating sets. Schedule 1114, various stations, weatherproof rockets. Schedule 1115, various stations, miscellaneous prismatic reflectors, and miscellaneous acid-etched globes. Bidders desiring to submit proposals should make application to the bureau or to the nearest navy yard purchasing office.

LIGHTING FIXTURES.—Proposals will be opened in the Supervising Architect's office, Treasury Department, Washington, D. C., at 3 p. m., May 24, 1917, for furnishing and installing lighting fixtures in the United States post offices at Alliance, Neb.; Elkins, W. Va.; Huntington, Ind.; Kalispell, Mont.; Newark, O.; Orlando, Fla.; Pottstown, Pa.; Roseburg, Ore.; Rumford, Me.; South Bethlehem, Pa.; South Boston, Va., and Vancouver, Wash., in accordance with drawings and specifications, copies of which may be had at that office. Proposals are desired only from those qualified to produce work of the highest grade, both artistically and mechanically, and the right is reserved to refuse to send the drawings and specifications to or to receive proposals from anyone who, in the opinion of the Supervising Architect, is not so qualified. James A. Wetmore, Acting Supervising Architect.

INCORPORATIONS

BIRMINGHAM, ALA. — Oliver-Walstrum Armature Works. Capital, $12,000. Incorporators: S. W. Oliver, A. H. Walstrum and H. F. Walstrum.

CHICAGO, ILL.—Great Lakes Electric Manufacturing Company. Capital, $25,000. Incorporators: G. A. Johnson, G. A. Chritton and C. C. Becker.

NEW YORK, N. Y.—The Guy V. Williams Company. Capital, $15,000. Electric lamps, wires, etc. Incorporators: H. H. and G. V. T. Cole, 116 Broad Street.

KELLOGG, IDAHO.—Safety Electric Railway Switch Company. Capital, $500,000. Manufacture electric railway switches. Incorporators: John George, John Spelling, J. S. Wilson, D. Price and Charles Lafavre.

ST. LOUIS, MO.—Machine Products Company. Capital, $10,000. Manufacture and deal in electrical appliances and devices. Incorporators: Joseph Desloge, George M. Johns, Franklin McDermott and Louis Desloge.

NEW YORK, N. Y.—Columbia X-Ray & Electric Corporation. Capital, $20,000. To manufacture X-ray machines and electric therapeutic apparatus. Incorporators: C. E. Kramer, R. and B. L. Spitzer, 254 West Seventy-second Street.

BUFFALO, N. Y.—United States Fuse Corporation. Capital, $500,000. Manufacture electric fuses, etc. Incorporators: Howard H. Baker, 52 Oxford Avenue; James W. Charters, 540 Walden Avenue, and Clarence F. Booth, 52 Woodward Avenue.

JERSEY CITY, N. J.—Wateree Electric Company. Capital, $7,500,000. To operate electric light and power plants. Incorporators: Walter C. Parker, David C. Phillips and Alexander M. Sands, Jr. Registered agent, Frank P. McDermott, 75 Montgomery Street.

FINANCIAL NOTES

Kings County Electric Light & Power Company, at a meeting of its board of directors, declared a regular quarterly dividend of $2 per share, payable June 1 to stockholders of record on May 21.

The Union Gas & Electric Company of Cincinnati reports for 1916 total earnings of $1,778,943 and net earnings of $1,758,915. Dividends paid were $1,752,815, leaving a surplus of $6,100 with the holding company.

The Long Island Lighting Company has petitioned the New York Public Service Commission, asking for authority to issue $561,000 on first mortgage five-per-cent 25-year gold bonds, under an existing mortgage, and for approval of a supplement to said mortgage.

Gross earnings from all sources of the combined constituent companies of the American Cities Company amounted in 1916 to $15,464,361, as compared to $14,145,442 in 1915, an increase for the last year of 9.3 per cent. This compares with a decrease of 4.3 per cent in 1915 and is the largest increase since 1907. Operating expenses and taxes rose from $9,121,734 in 1915 to $9,965,083 in 1916, so that the net earnings at $5,499,278 represented a gain of 9.4 per cent. After deducting $3,810,259 for interest, bond discount, amortization and miscellaneous, the amount applicable to stock dividends was $1,689,019 in 1916, as compared to $1,366,510 in 1915, an increase of $322,509.

Hugh McRae, president of the Tidewater Power Company, has addressed a letter to the stockholders of the company, in which he advises them of the sale of his interest in the company to Brooks & Company, Scranton, Pa. The company has $595,000 of six-per-cent preferred stock and $600,000 of common stock outstanding. On the common dividends at the rate of seven per cent are being paid. Mr. McRae says that holders of common

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

	Div. rate per cent.	Bid May 7.	Bid May 14.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	..	23½	22
Adirondack Electric Power of Glens Falls, preferred	6	78½	75
American Gas & Electric of New York, common	10+extra	128	130
American Gas & Electric of New York, preferred	6	49½	49¼
American Light & Traction of New York, common	..	320	309
American Light & Traction of New York, preferred	6	112	110
American Power & Light of New York, common	4	75	70
American Power & Light of New York, preferred	6	88½	88½
American Public Utilities of Grand Rapids, common	..	33	34
American Public Utilities of Grand Rapids, preferred	6	66	66
American Telephone & Telegraph of New York	..	122¾	118¾
American Water Works & Elec. of New York, common	..	8½	7
American Water Works & Elec. of New York, particip.	7	28	26
American Water Works & Elec. of New York, first preferred	..	81½	78
Appalachian Power of Bluefield, common	..	5	5
Appalachian Power of Bluefield, preferred	7	35	33
City Service of New York, common	6+extra	279	†274
City Service of New York, preferred	6	87	84¼
Commonwealth Edison of Chicago	8	127½	124
Comm. Power, Railway & Light of Jackson, common	4	51	51
Comm. Power, Railway & Light of Jackson, preferred	6	74	74
Federal Light & Traction of New York, common	..	11	11½
Federal Light & Traction of New York, preferred	..	42	43
Illinois Northern Utilities of Dixon	6	81	78
Middle West Utilities of Chicago, common	2+2 extra	50	†43
Middle West Utilities of Chicago, preferred	6	71	67
Northern States Power of Chicago, common	7	94½	89
Northern States Power of Chicago, preferred	7	98½	96
Pacific Gas & Electric of San Francisco, common	5	59¾	55
Pacific Gas & Electric of San Francisco, preferred	6	91¼	88
Public Service of Northern Illinois, Chicago, common	7	98½	92
Public Service of Northern Illinois, Chicago, preferred	6	100	96
Republic Railway & Light of Youngstown, common	4	36	29
Republic Railway & Light of Youngstown, preferred	6	67	64
Standard Gas & Electric of Chicago, common	..	11	11
Standard Gas & Electric of Chicago, preferred	6	36½	35
Tennessee Railway, Light & Power of Chattanooga, common	..	7	5¼
Tennessee Railway, Light & Power of Chattanooga, preferred	6	26	26
United Light & Railways of Grand Rapids, common	4	40	40
United Light & Railways of Grand Rapids, preferred	6	72	68
Western Power of San Francisco, common	..	14	13
Western Power of San Francisco, preferred	6	54	52
Western Union Telegraph of New York	5+extra	94¾	91½
Industrials—			
Electric Storage Battery of Philadelphia, common	4	59	60
General Electric of Schenectady	8	158	*158
National Carbon of Cleveland, common	8	*75⅛	*75⅛
National Carbon of Cleveland, preferred	7	*133	*133
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	47½	48¾
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	64	*64

* Last sale. † Ex-dividend.

stock may dispose of their interest to Brooks & Company at $105 a share, payable in negotiable notes, one for one-half the purchase price payable on or before November 16, 1919, and one for the balance of the purchase price payable on or before May 16, 1920, with interest on deferred payments at six per cent per annum. Mr. McRae says that in addition Brooks & Company further agree to transfer certain real estate now owned by the Tidewater Power Company to the present stockholders of the company as an additional payment on the stock.

Reports of Earnings.

APPALACHIAN POWER.

Appalachian Power Company has issued a comparative statement of earnings and expenses for the month of March and the years ending March 31, 1916 and 1917, as follows:

March—	1917.	1916.
Gross earnings	$ 70,986	$ 63,983
Operating expenses	31,224	27,909
Net earnings	39,762	36,074
Other income	69	320
Total income	39,831	36,394
Twelve months—		
Gross earnings	821,176	680,107
Operating expenses	363,126	316,134
Net earnings	458,051	363,973
Other income	3,552	780
Total income	461,603	364,754
Bond interest	281,436	272,500
Note interest	160,235	152,060
General interest	13,360	8,767
Less interest charged to construction	.....	134,492
Net income	6,571	65,918

COLORADO POWER.

March—	1917.	1916.
Gross earnings	$ 93,517	$ 73,016
Operating expenses	40,415	31,482
Net earnings	53,103	41,533
Other income	5,093	1,430
Total income	58,196	42,963
Operating ratio	43.2%	43.1%
Twelve months—		
Gross earnings	$1,084,295	$ 861,507
Operating expenses	479,847	346,559
Net earnings	604,448	514,947
Other income	40,929	32,543
Total income	645,377	547,490
Interest on funded debt	221,542	207,460
Depreciation reserve	107,873	84,560
Net income	315,962	255,470
Preferred dividends	41,300	29,726
Common dividends	221,264	110,632
Surplus	53,398	115,113
Operating ratio	44.3%	40.1%

Electrical Patents Issued May 8, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,224,887. Electric Time-Switch. G. M. Bacon, Salt Lake City, Utah. Wall snap-switch supplied with time mechanism.

1,224,895. Induction Motor. F. Blanc, assignor to Siemens-Schuckertwerke, G. M. B. H., Berlin, Germany. Provision for giving strong starting torque and varying reactance of a squirrel-cage winding.

1,224,907 and 1,224,908. Electrical Connector. H. A. Douglas, assignor to Douglas & Rudd Mfg. Co., Bronson, Mich. Sockets for receiving lamps with bayonet point connection.

1,224,922. Mouthpiece for Telephone Instruments. C. M. Hartnett, Chicago, Ill. Manner of securing in position on transmitter.

1,224,952. Electric Switch Structure. S. R. Naginey, assignor of one-half to C. E. Maxwell, Bremen, O. Mounted on joint of air hose and operated by coupling and uncoupling.

1,224,956. Telegraph Transmitter. E. H. Piersen, Topeka, Kans. Power drivers with key-controlled character members.

1,224,966. Electrical Distributing Means. E. O. Schweitzer, Chicago, Ill. Arrangement of terminal connections and apparatus in a post.

1,224,970. Lineman's Shield. F. K. Singer, assignor to American Telephone & Telegraph Co., New York, N. Y. For covering live wires.

1,224,971. Multiple Service Connection. J. T. Skinner, Lawrence, Kans. Structural details.

1,224,983. Electric Regulator. T. S. Watson, assignor to Car Lighting Improvement Co., Milwaukee, Wis. Resistance regulator for maintaining constant voltage on a car-lighting system.

1,224,984. Process of Eliminating Salts of the Weak Sulfur Acids from Fixed Photographic Media. S. H. Weinhandler, New York, N. Y., and J. S. Simsorn, Philadelphia, Pa. Developed films are subjected to a salt solution while the latter is electrolyzed.

1,224,986. Apparatus for Charging Storage Batteries. D. H. Wilson, assignor to Wilson Storage Battery Co., New York, N. Y. Current is automatically increased and decreased step by step by time-controlled apparatus.

1,224,987. Attachment Plug. R. B. Wilcott, assignor to R. S. Mueller, Cleveland, O. Structural details.

1,225,010. Edge Setter. E. N. Chandler, Braintree, Mass. Electrically heated.

1,225,014. Electrical Testing Apparatus. C. J. Conner, Coatesville, Pa. Method of finding grounds on lines.

1,225,032. Reflector. P. M. Hotchkin, Chicago, Ill. For a light projector.

1,225,049. Socket Cover. H. Northwood, Wheeling, W. Va. Details of husk supporting shade, etc.

1,225,051. Portable Electric Lamp. H. M. Peters, Chicago, Ill. Adjustable, standing lamp-support.

1,225,052. Process for Treating Organic Compounds by Electrolysis. A. Puguet, assignor to Society of Chemical Industry in Basle, Basle, Switzerland. Organic body is supplied in solution not mixable with electrolyte and an emulsion formed which is localized at one electrode.

1,225,096. Motor Controller. C. W. Yerger, assignor to Cutler-Hammer Co., Milwaukee, Wis. Insures proper relative operation of armature shunt and accelerating means.

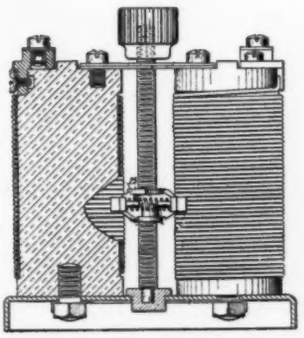
1,225,125. Electric-Cable Clamp. M. Guett, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Details of sheet-metal structure.

1,225,127. Connector for Circuit Wires. L. W. Heath, Hastings, Mich. Pair of interlocking sheet-metal members for securing wire ends.

1,225,136. Sound-Intensifying Device for Telephones. H. J. Kastner, Dayton, Mich. Manner of mounting receiver and intensifier.

1,225,147. Insulator. F. M. Locke, Victor, N. Y. Heat-resisting glass of low coefficient of expansion.

1,225,175. Apparatus for Generating Electricity. S. A. Reed, New York, N. Y. Details of hydrogen or carbon-consuming cell with a fused-acid electrolyte.



No. 1,225,227.—Rheostat.

1,225,194. Arc-Light Electrode. R. P. Walker, assignor to National Carbon Co., Cleveland, O. Has two channels, one containing flaming material and the other a metal conductor.

1,225,203. Means for Utilizing Electrically Transmitted Impulses. E. H. Amet, Redondo Beach, Cal. Telephone receiver pneumatically operates recording stylus.

1,225,212. Art of Drying Bodies. G. H. Benjamin, New York, N. Y. Method of treating cellular bodies by heat and electric light.

1,225,227. Rheostat. C. W. Dunham, assignor to Union Switch & Signal Co., Swissvale, Pa. Details of device having bridge moved over pair of tubular resistance units by a screw. (See cut.)

1,225,249. Insulated Screw-Driver. L. D. D. Holtschneider, St. Louis, Mo. Has a wooden handle and an insulating tube about the shank.

1,225,250. Apparatus for Measuring the Gloss of Non-Metallic Surfaces. L. R. Ingersoll, Madison, Wis. Employs an electric light source.

1,225,261. Flashlight Apparatus. D. C. McCandless, Boise, Idaho. Has electric ignition of flash, electric lamps and electrical control of shutter.

1,225,279. Attachment for Electric-Lamp Socket-Keys. A. H. Simmons, assignor of one-third to P. B. Asch, Chicago, Ill. To adapt for pull-cord operation.

1,225,283 and 1,225,284. Automatic Electric Generating Apparatus. C. F. Strong, Des Moines, Iowa. Combination of engine, generator and storage battery for starting, ignition and lighting system for automobiles.

1,225,290. Insulation Repairing Device. W. C. Ulrich, assignor of one-half to P. J. Lavalle, St. Paul, Minn. For mending insulation of conductors.

1,225,291. Telephone System. F. Ward, G. H. Bryant and T. Inman, assignors to Relay Automatic Telephone Co., London, England. Automatic.

1,225,297 and 1,225,298. Connector and Connection for Storage Batteries. T. A. Willard, assignor to Willard Storage Battery Co., Cleveland, O. For securing conductors to terminals of battery plates.

1,225,299. Pothead Connector. P. F. Williams, assignor to G. & W. Electric Specialty Co., Chicago, Ill. Structural details.

1,225,300. Connecting Device for Electric Conductors. P. F. Williams, assignor to G. & W. Electric Specialty Co., Chicago, Ill. Construction of pothead.

1,225,306. Electric Battery. R. C. Benner and H. F. French, Fremont, O., assignors to National Carbon Co., New Jersey corporation. Structure of dry-cell.

1,225,312. Speedometer. A. A. Canton, assignor to Device Testing Co., Connecticut. Electric indicator operated by impulses varied according to the speed.

1,225,316. Process of Making Rail-Bonds. L. P. Crecelius, assignor to Electric Railway Improvement Co., Cleveland, O. Manner of securing terminals to the bonding conductor.

1,225,330. Magneto. O. Heins and C. M. Wild, assignor to Bosch Magneto Co., New York, N. Y. Details of structure for ignition systems.

1,225,332. Method of and Apparatus for Translating Electrical Variations. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Vapor device for detecting feeble electrical variations.

1,225,333. Apparatus for Translating Electrical Variations. P. C. Hewitt, Ringwood Manor, N. J. Modification of above and in combination with an energy-receiving aerial.

1,225,335. Control Means for Motion-Picture Printing Machines. A. S. Howell, assignor to Bell & Howell Co., Chicago, Ill. Stopping mechanism is electrically controlled by film.

1,225,337. Separable Attachment Plug. W. C. Jones, Chicago, Ill. Details of construction.

1,225,346. Gravity-Battery Electrode. P. T. MacNamara, assignor to Western Union Telegraph Co., New York, N. Y. Structural details.

1,225,357. Variable Resistance Device. R. E. Reed, Ripon, Wis. Superposed carbon blocks in tubular casing has means for varying endwise pressure.

1,225,366. Joint for Electrical Conductors. C. B. Schoenman, Wilkinsburg, and R. M. Houck, Swissvale, Pa. Comprises pair of sections which are secured to conductor ends and welded together.

1,225,368. Method of Making Resistance Elements. M. L. Severy, assignor to Severy Mfg. Co., Boston, Mass. Elements of different resistances at different points are formed by feeding plastic materials of different conductivities at different rates to mixing device from which element is ejected.

1,225,373. Method of Electric Welding. R. D. Thomson, assignor to Thomson Electric Welding Co., Lynn, Mass. Manner of welding a seam by a rolling electrode.

1,225,388. Electromagnetic Switch. J. L. Woodbridge, Philadelphia, Pa. Operating coil has rising voltage characteristic neutralized by negative temperature coefficient resistor with drooping voltage characteristic.

1,225,391. Attachment Plug. E. G. K. Anderson, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Structural details of separable device.

1,225,396. Method of Producing Carbonic Oxid. G. H. Benjamin, New York, N. Y. Comprises the dissociation of carbon dioxid, evolved from coal by heat, by subjecting to a high temperature created by passing current through coal charge as resistor.

1,225,397. Shade-Supporting Device. R. B. Benjamin, assignor to Benjamin Electric Co., Chicago, Ill. For attachment to lamp sockets.

1,225,411. Electric Lighting Fixture. A. Cohn and L. H. Debs, Chicago, Ill. Structure of upstanding lamp-cluster support.

1,225,425. Protector for Incandescent Lamps and the Like. E. C. B. Fox, assignor to Franklin Electric Mfg. Co., Hartford, Conn. Lamp-bulb-inclosing device for shipping, etc.

1,225,429. Microphonic Signaling Device. J. Gardiner, Knott End, England. Vibratory reeds have specially constructed microphonic contact.

1,225,433. Detachable Contact-Plate. G. W. Gilmore, Alliance, O. Structural details.

1,225,437. Electric Signal and Damper Control. P. W. Hammond, Columbus, O. Alarm circuit is controlled by position of valve.

1,225,457. Combination Coil and Condenser for Dynamos. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. A magneto has a removable core carrying a generating winding and a condenser.

1,225,460. Insulator Wall-Bracket. J. B. McCarthy, assignor to National Metal Molding Co., Pittsburg, Pa. For attachment of conductors to walls.

1,225,463. Mouthpiece for Telephones and the Like. J. T. McGonigal, Pottersdale, Pa., assignor of one-half to M. T. Bowman, Clearfield, Pa. Antiseptic guard.

1,225,467. Spark-Plug. O. S. Miller, assignor of one-half to C. M. Gidley, Philadelphia, Pa. Structural details.

1,225,472. Automobile Tail-Light. J. A. Morin, Springfield, Vt. Arrangement of multiple lamps, reflector, colored screen and license-plate illuminating slot.

1,225,478. Tube Flange and Clamping Device Therefor. T. E. Murray, New York, N. Y. A channeled ring has its inner rim butt-welded to tube end.

1,225,491. Portable Electric Lamp. A. C. Becker, assignor to Waterbury Mfg. Co., Waterbury, Conn. Flashlight simulating a candlestick.

1,225,493. Railway Signaling System. A. Rioux, assignor of one-half to J. Richard, Nashua, N. H. For indicating a broken third rail.

1,225,507. Magnetic Circuit-Closer for Train Stops and Signals. H. C. Sedgwick, assignor to National Safety Appliance Co., Mill Valley, Cal. Special structure of circuit-closer on train, operated by track magnet.

1,225,508. Train-Stop and Signaling System. H. G. Sedgwick, assignor to National Safety Appliance Co., Mill Valley, Cal. Has one set of engineer's signals for forward and another for rearward movement.

1,225,509. Electric Welding. J. A. Seede, assignor to General Electric Co., Schenectady, N. Y. Certain resistance which is initially included in field circuit of arc-welding generator is automatically cut out by welding current.

1,225,525. Outlet Box and Support Therefor. O. T. Sweet, St. Louis, Mo. Structural details.

1,225,526. Electrical Receptacle. G. B. Thomas, assignor to Bryant Electric Co., Bridgeport, Conn. Flush, plug receptacle.

1,225,532. Power System and Apparatus. R. Varley, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Gearing of lighting generator and starting motor to engine.

1,225,533. Ignition System and Apparatus. R. Varley, Englewood, N. J. Structure of interrupter.

1,225,534, 1,225,535 and 1,225,536. Electrical System. R. Varley, Englewood, N. J. Arrangements of ignition circuits.

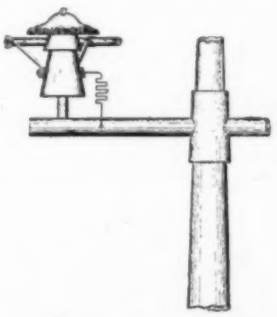
1,225,553. Electrical Conduit. C. W. Abbott, assignor to American Conduit Mfg. Co., Pittsburgh, Pa. Structure of joint.

1,225,580. Electric Switch. H. E. Clifford, assignor to General Electric Co., Schenectady, N. Y. Method of preventing formation of explosive gaseous mixtures in oil switches.

1,225,587. Protecting Means for Transmission Systems. E. E. F. Creighton, assignor to General Electric Company, Schenectady, N. Y. An arcing ring is arranged on insulation adjacent live wire and is connected to ground through resistance rendering discharges non-oscillatory. (See cut.)

1,225,595. Brake Mechanism. E. A. Dietrich, New York, N. Y. Arrangement of gearing, brake mechanism, limit switches and reversible electric motor for winding a spring motor.

1,225,603. Measured-Service Telephone System. J. Erickson, assignor to Automatic Electric Co., Chicago, Ill. Automatic system.



No. 1,225,587.—Protecting Means for Transmission Systems.

1,225,614. Conduit Connector. H. R. Gilson, assignor to National Metal Molding Co., Pittsburgh, Pa. Structure of T connection.

1,225,631. Portable Electric Water-Heater. C. E. Hinkle, Roswell, N. Mex. Arrangement of water coils and electric resistors.

1,225,639. Method and Means of Voltage Control. S. E. Johannesen, assignor to General Electric Co., Schenectady, N. Y. For maintaining constant current in an alternating circuit.

1,225,643. Electric Gas-Engine Starting and Battery-Charging System. H. H. M. Kammerhoff, Orange, N. J. Control and gearing of machine acting as starting motor and charging and lighting generator in a system for automobiles.

1,225,652. Shutter-Operating Attachment for Cameras. T. Kruger, Peoria, Ill. Electromagnetically actuated.

1,225,672. Telephone Transmitter and Mouthpiece. H. Nakai, Havre, Mont. Use of the telephone is prevented when the mouthpiece is removed.

1,225,681. Igniter and Valve Mechanism. F. E. Rupright, assignor of one-half to W. Pennington, Interlochen, Mich. Comprises engine-ignition details.

1,225,686. Electric Controller. H. F. Stratton, assignor to Electric Controller & Mfg. Co., Cleveland, O. For induction motors.

1,225,687. Electromagnetic Apparatus. H. F. Stratton, assignor to Electric Controller & Mfg. Co., Cleveland, O. Structure of alternating-current electromagnet.

1,225,694. Car-Handling Apparatus. F. E. Woodford, Chicago, Ill. Motors and brakes of several railway cars are controlled from a common, distant point.

1,225,700. Shadeholder. W. L. Collins, Pittsburgh, Pa. Details of structure comprising spring band for gripping rim of shade.

1,225,714. Automobile Signal. E. L. Johnson, Kansas City, Mo. Detailed arrangement of contacts and operating mechanism for electric lighted, movable casing.

1,225,736. Signaling System. C. P. Nachod, assignor to Nachod Signal Co., Philadelphia, Pa. Arrangement and control of stop and permissive signals for vehicles.

PATENTS EXPIRED.

The following United States electrical patents expired on May 15, 1917:

649,441. Sparking Igniter for Explosive Engines. C. E. Duryea, Peoria, Ill.

649,468. Trolley. J. H. Morey and T. R. Watkins, Trenton, Mich.

649,491. Electric Storage Battery. E. A. Sperry, Cleveland, O.

649,526. Safety Synchronizing Device. J. Pearson, Minneapolis, Minn.

649,527. Cutout. E. Pettet, Farmer City, Ill.

649,544. Bracket for Electric Lamps. W. H. Morse, Billings, Mont.

649,549. Electric-light System. H. F. Roach, St. Louis, Mo.

649,551. Carbon for Electric Lights. J. F. Sanders, Portland, Ore.

649,552. Brush-holder for Electric Machines. H. Sawyer, Muskegon, Mich.

649,554. Electric Switch. F. Schwedtmann, St. Louis, Mo.

649,572. Controlling and Distributing Electric Energy. F. W. Erickson, Boston, Mass.

649,574. Spacing Rib or Block for Armature Cores. J. A. Foshag, Schenectady, N. Y.

649,586. Closed-Conduit Electric Railway. D. G. Stoughton, Hartford, Conn.

649,587. Electric Clock. S. P. Thrasher, New Haven, Conn.

649,589 and 649,591. Secondary Electric Clock. S. P. Thrasher, New Haven, Conn.

649,612. Pyrotechnic Alarm. J. C. Moore, Philadelphia, Pa.

649,614. Apparatus for Electrolysis. A. E. Peyrusson, Limoges, France.

649,620. Electric Brake. C. W. Steel and W. A. Nesbitt, Toronto, Can.

649,621. Apparatus for Transmission of Electrical Energy. N. Tesla, New York, N. Y.

649,623. Automatic Musical Instrument. J. A. Weser, New York, N. Y.

649,632. Automatic Telephone-Toll Apparatus. L. M. Ericsson, Stockholm, Sweden, and S. Ritter, Copenhagen, Denmark.

649,644. Controller Mechanism. A. E. Norris, Cambridge, Mass.

649,653 and 649,654. Battery Compound. H. Blumenberg, Jr., New York, N. Y.

649,661. Electric Signaling Apparatus. F. K. Jassett, St. Louis, Mo.

649,699. System of Motor Control. C. W. Larson, Schenectady, N. Y.

649,707. Electric Meter. W. H. Pratt, Lynn, Mass.

649,726. Process of Protecting Electric Heating Conductors. W. S. Hadaway, Jr., New York, N. Y.

649,767. Electric Switch. F. L. Sessions, Oak Park, Ill.

649,778. Electrical Igniter for Gas Engines. D. M. Tuttle, Canastota, N. Y.

649,788. Induction Coil. H. E. Willis, Lebanon, N. H.

649,797. Means to Be Employed in Electric Traction. M. J. Barreau, Paris, France.

649,840. Process of Operating Primary Batteries and Regenerating Elements Thereof. H. K. Hess, A. J. Shinn and C. Hering, Philadelphia, Pa.

649,841. Process of Operating Two-Liquid Primary Batteries and Regenerating Elements Thereof. H. K. Hess, A. J. Shinn and C. Hering, Philadelphia, Pa.

649,862. Cloth-Cutter. R. Phillips, Baltimore, Md.

649,868. Telephone-Exchange System. W. D. Gharky, Philadelphia, Pa.

649,869. Exhibiting Machine. J. Heissenberger, New York, N. Y.

649,893. Printing Telegraph. J. Stocken, Kothen, Germany.